OMNI-DIRECTIONAL BAR CODE READING MODE

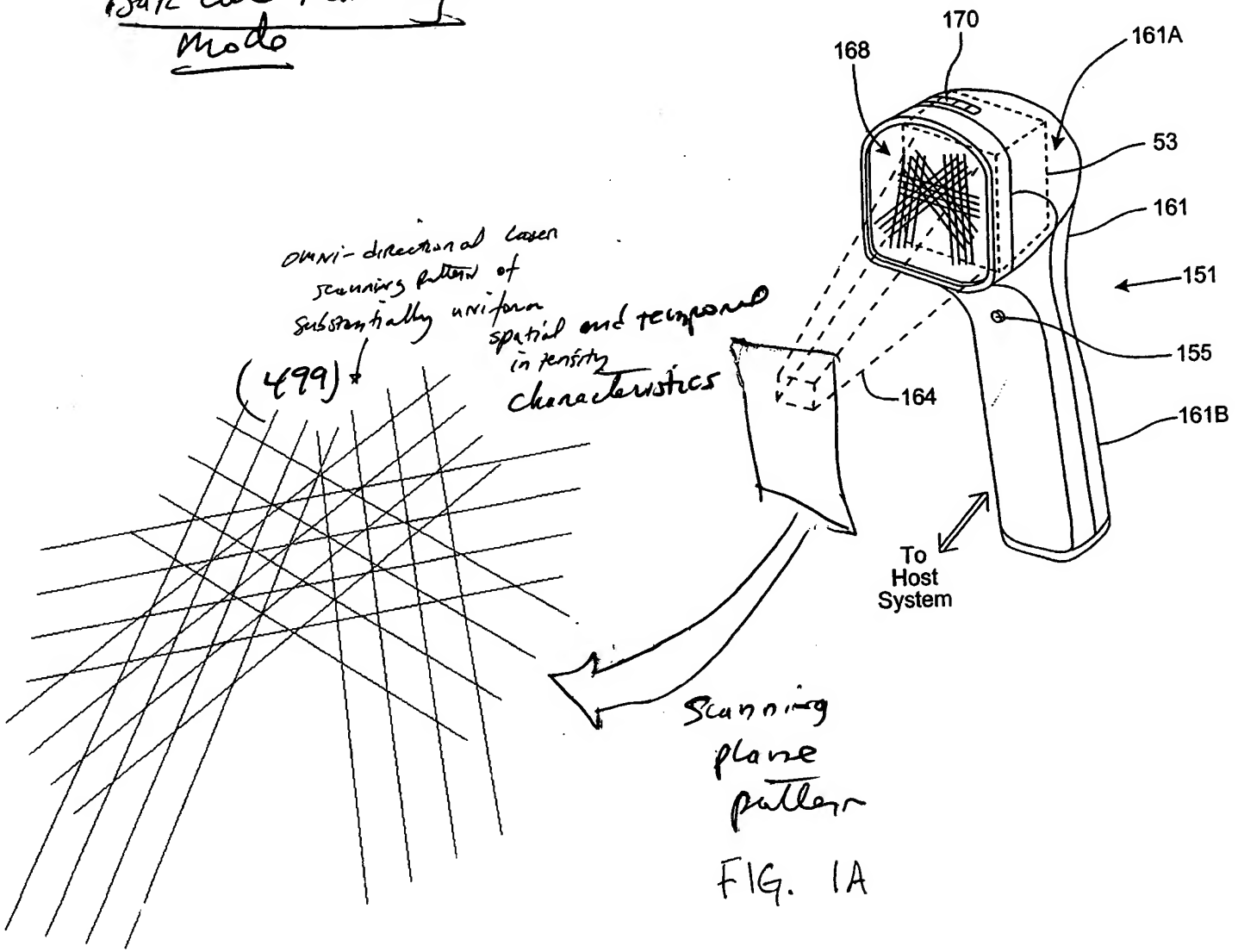


FIG. 1A

UNI-DIRECTIONAL
Bar Code Reading
mode

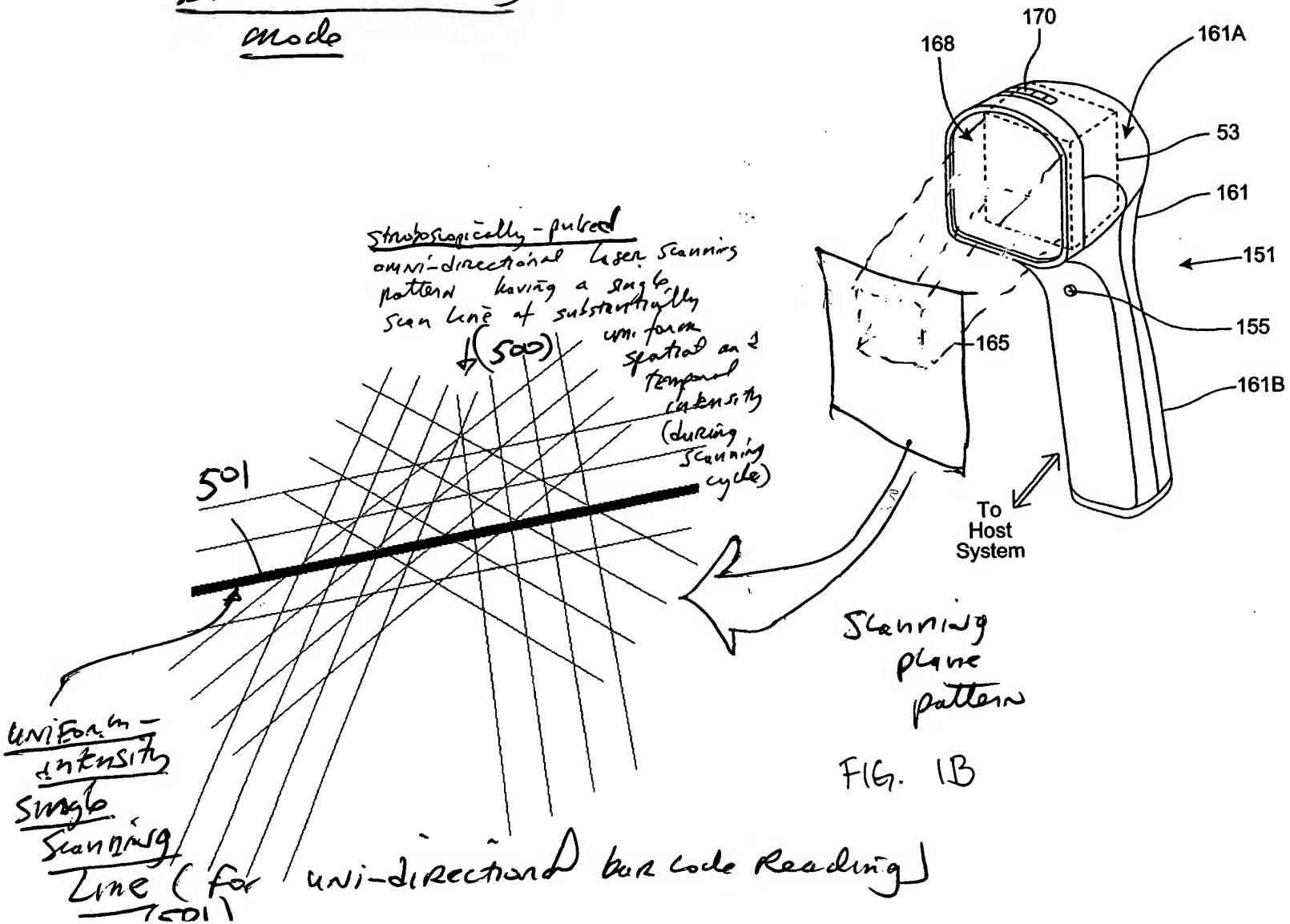


FIG. 1B

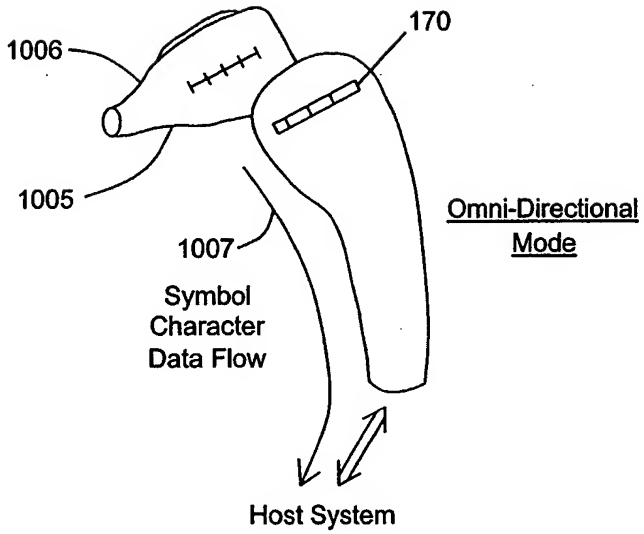

1006
170
1005
1007
Omni-Directional
Mode
Symbol
Character
Data Flow
Host System

FIG. 2A

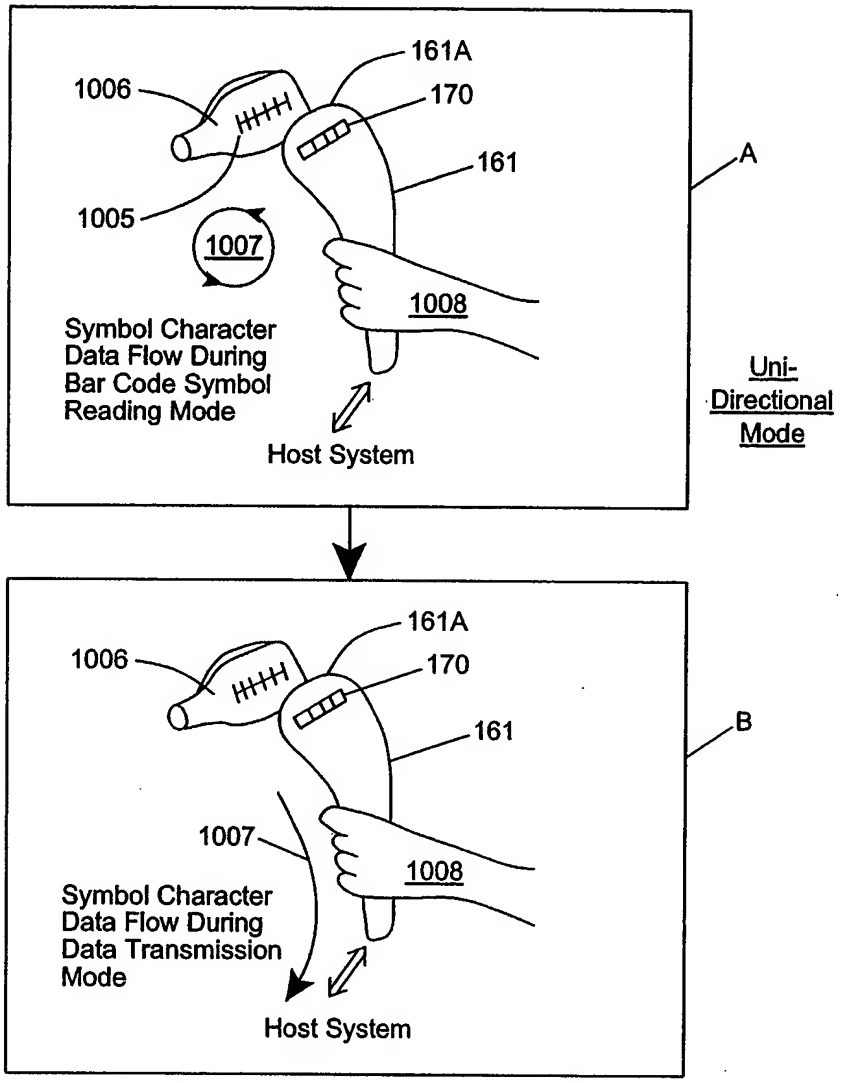

161A
1006
170
161
A
1005
1007
1008
Symbol Character
Data Flow During
Bar Code Symbol
Reading Mode
Host System
Uni-
Directional
Mode
161A
1006
170
161
B
1007
1008
Symbol Character
Data Flow During
Data Transmission
Mode
Host System

FIG. 2B

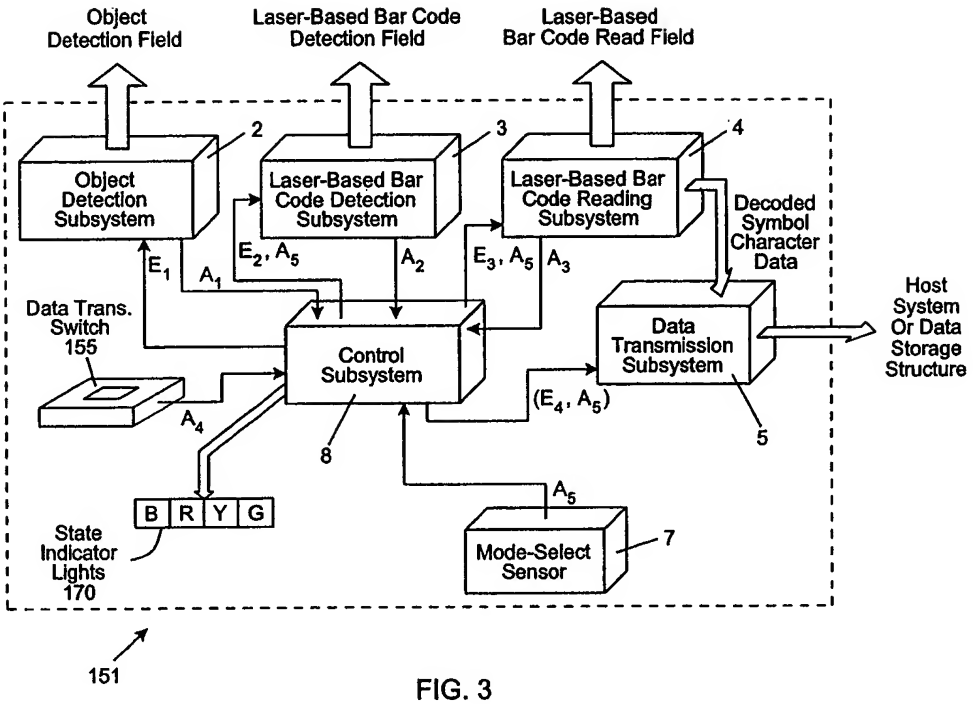

Object Detection Field
Laser-Based Bar Code Detection Field
Laser-Based Bar Code Read Field
Object Detection Subsystem
2
Laser-Based Bar Code Detection Subsystem
3
Laser-Based Bar Code Reading Subsystem
4
Decoded Symbol Character Data
E_1
A_1
E_2, A_5
A_2
E_3, A_5
A_3
Data Trans. Switch 155
Control Subsystem
Data Transmission Subsystem
Host System Or Data Storage Structure
A_4
(E_4, A_5)
8
5
A_5
B R Y G
State Indicator Lights 170
Mode-Select Sensor
7
151

FIG. 3

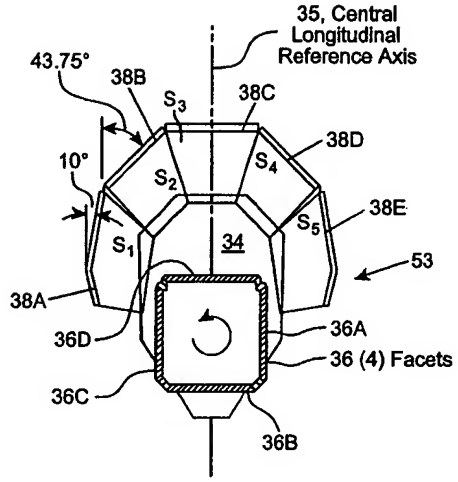


FIG. 4A

	Twist α	Bend θ
$S_{1\text{-}5}$	10°	46.0°
$S_{2\text{-}4}$	43.75°	42.5°
S_3	90°	40.5°

FIG. 5B

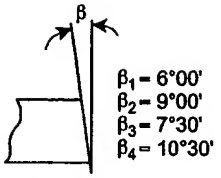


FIG. 5A

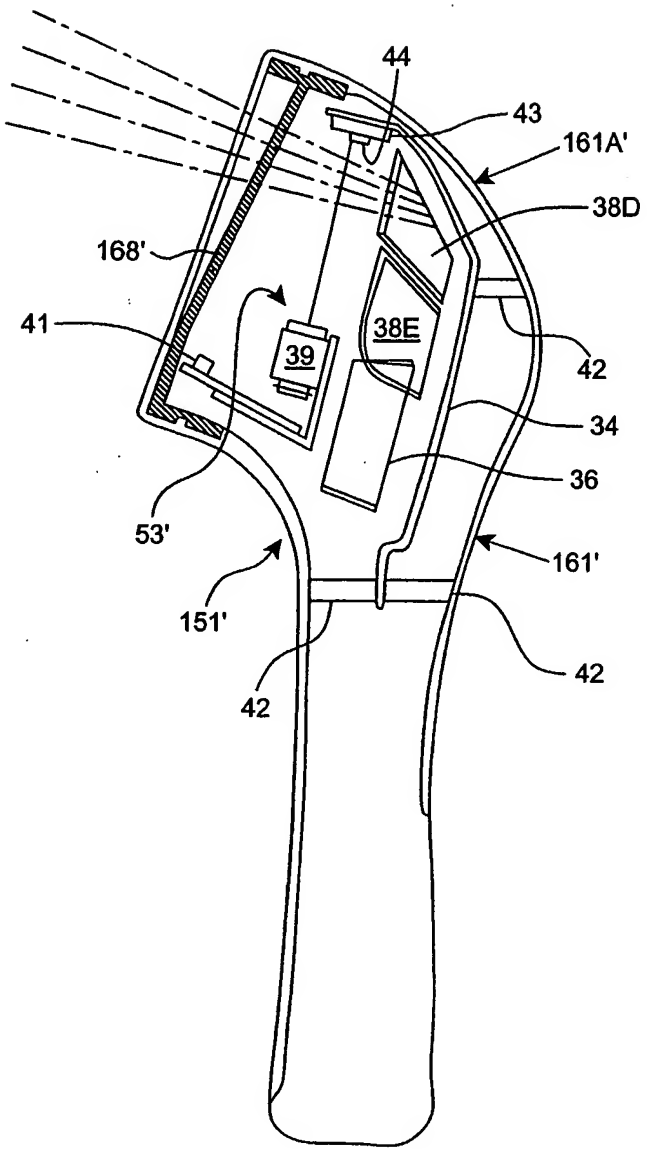


FIG. 4B

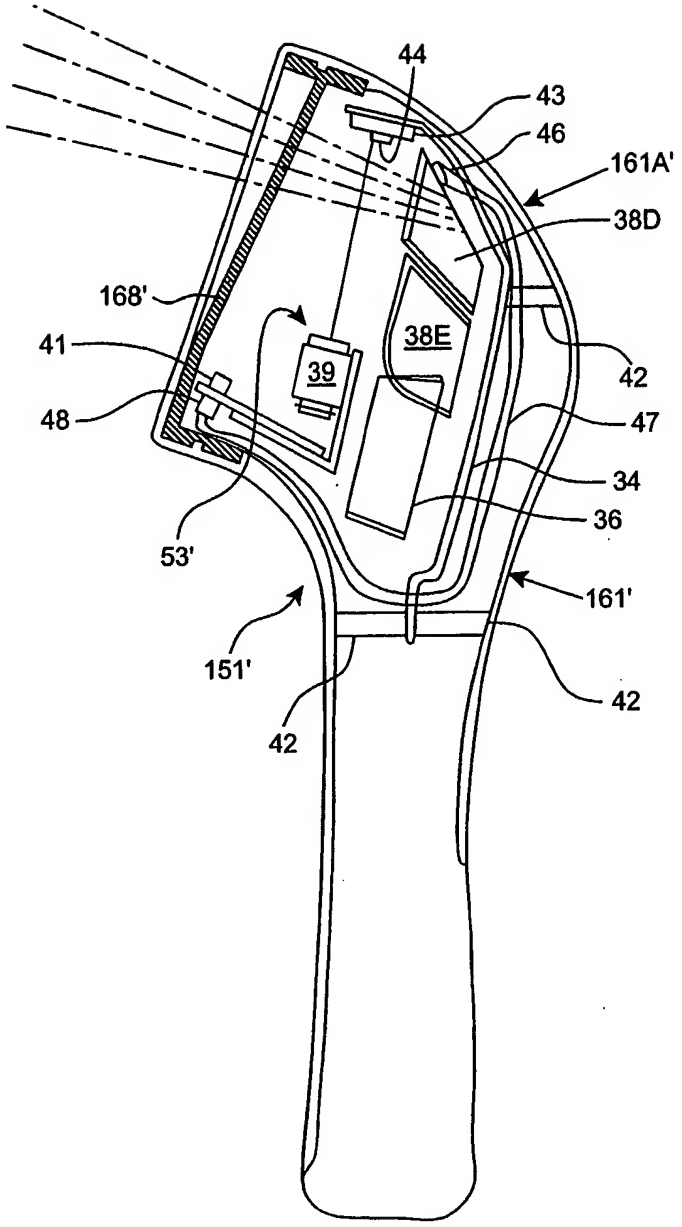


FIG. 4C

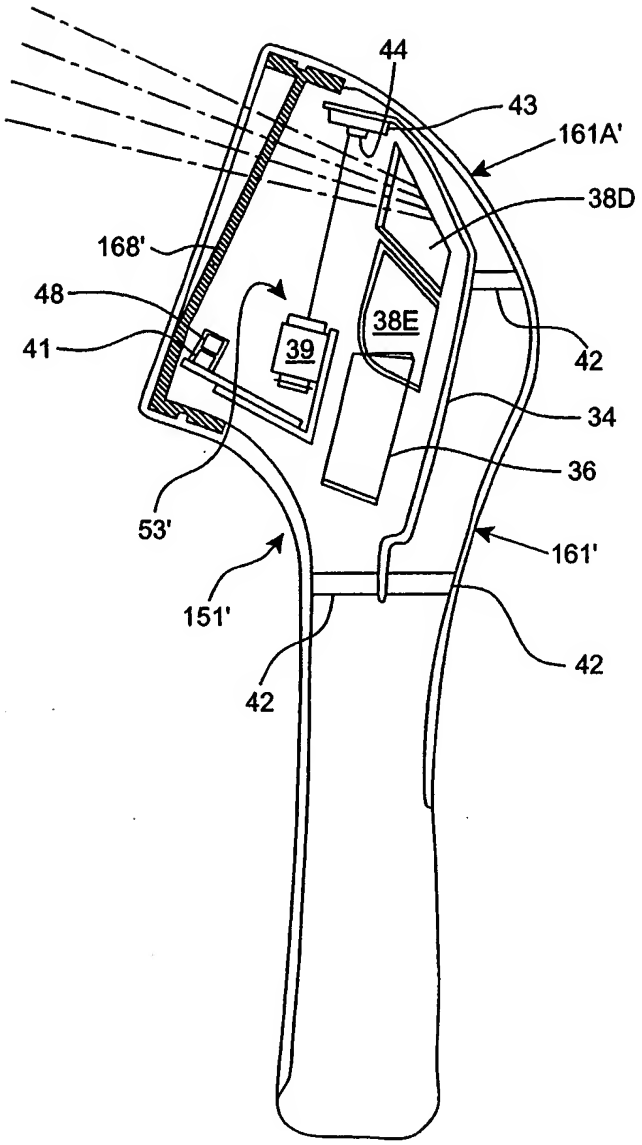


FIG. 4D1

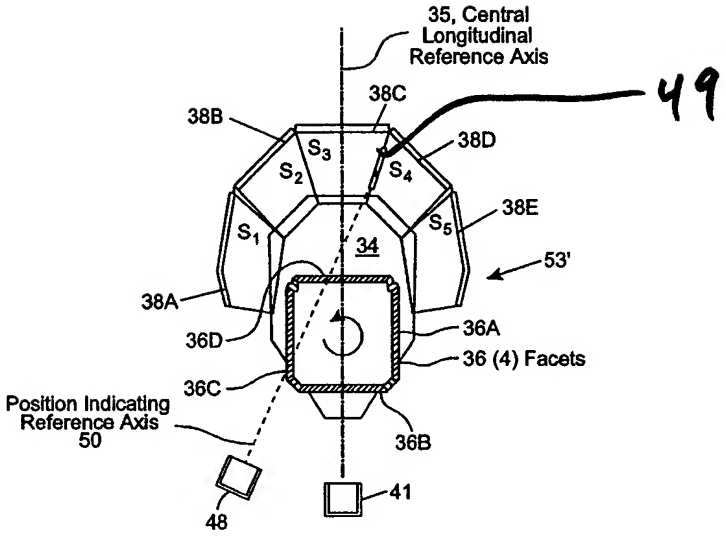

35, Central
Longitudinal
Reference Axis
49
38C
38B
38D
S_3
S_2
S_4
38E
S_1
S_5
34
53'
38A
36A
36D
36 (4) Facets
36C
Position Indicating
Reference Axis
50
36B
41
48

FIG. 4D2

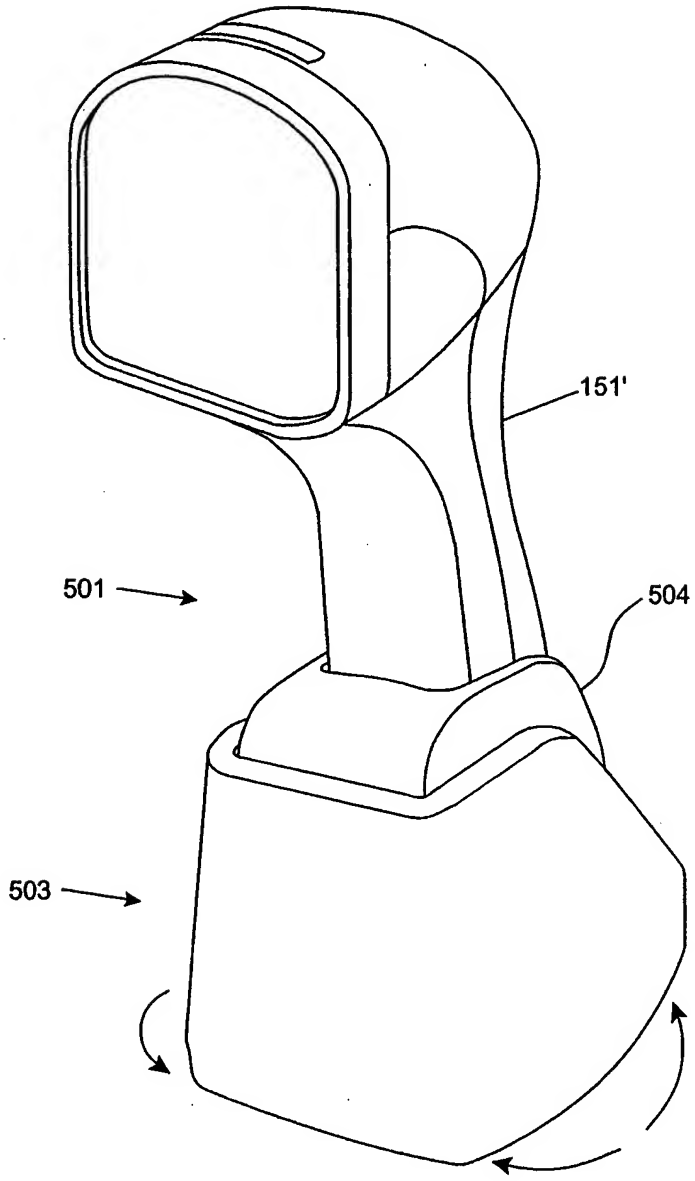


FIG. 5A

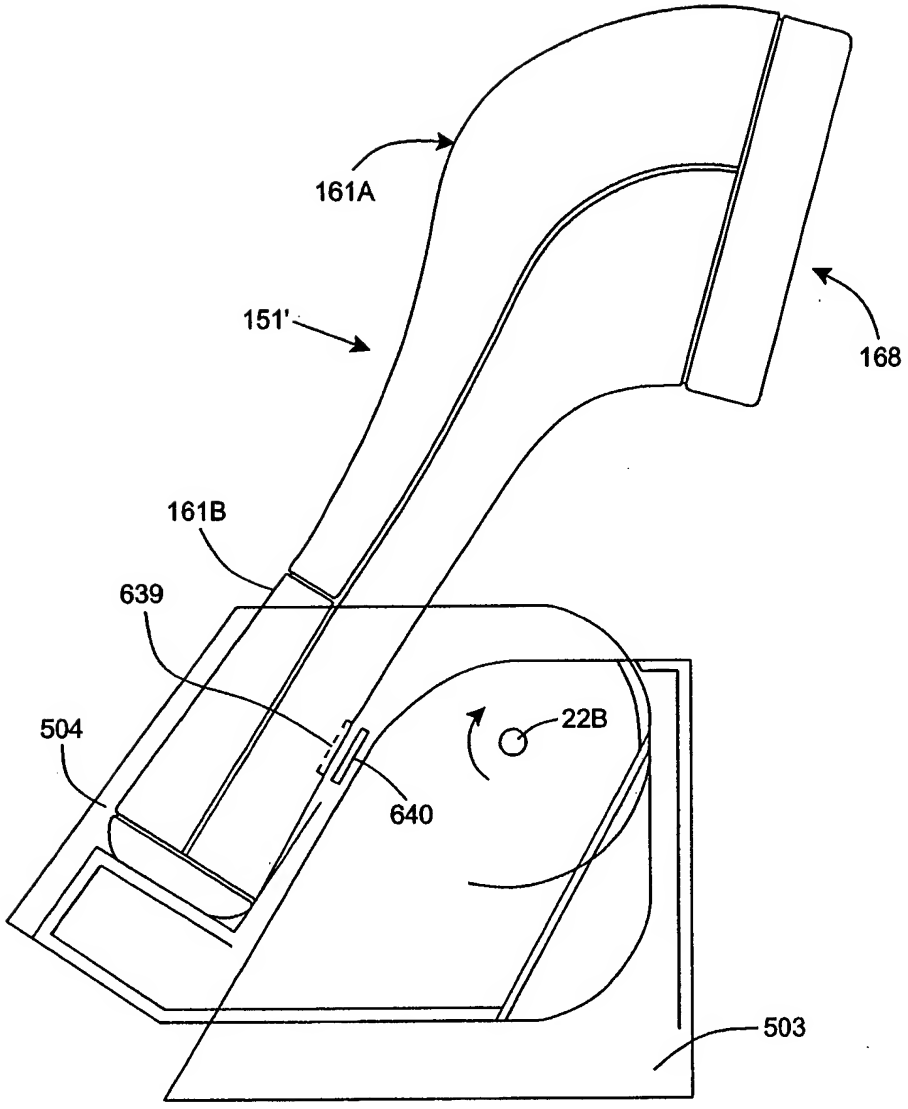


FIG. 5B

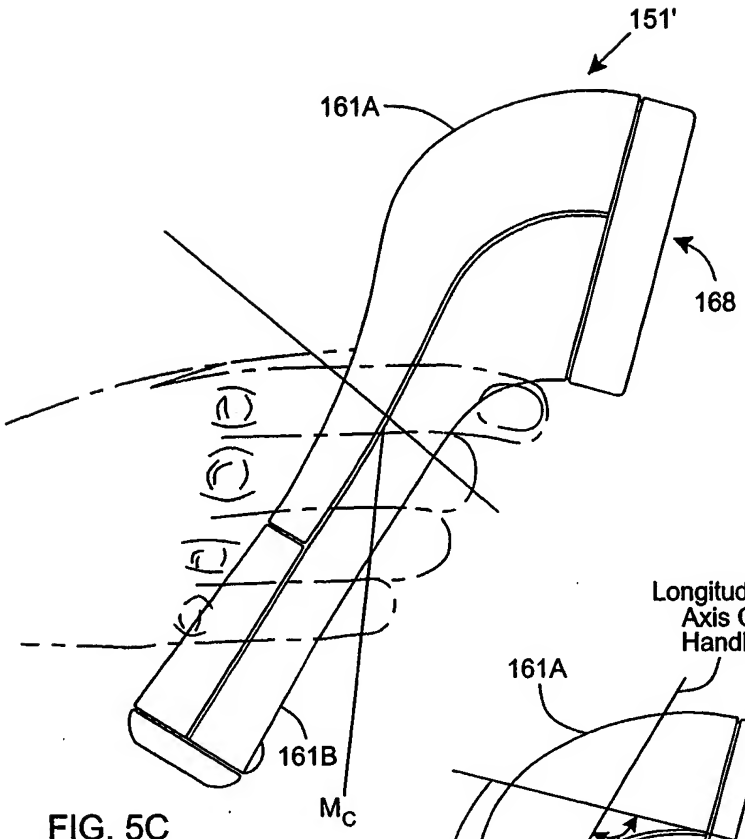

151'
161A
168
161B
M_C

FIG. 5C

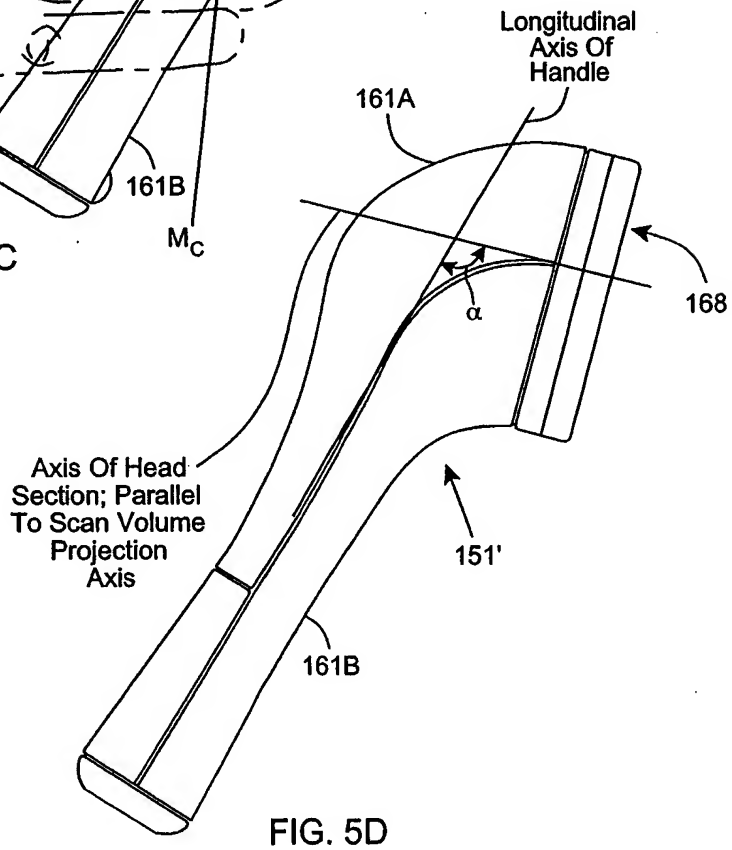

Longitudinal Axis Of Handle
161A
168
α
Axis Of Head Section; Parallel To Scan Volume Projection Axis
151'
161B

FIG. 5D

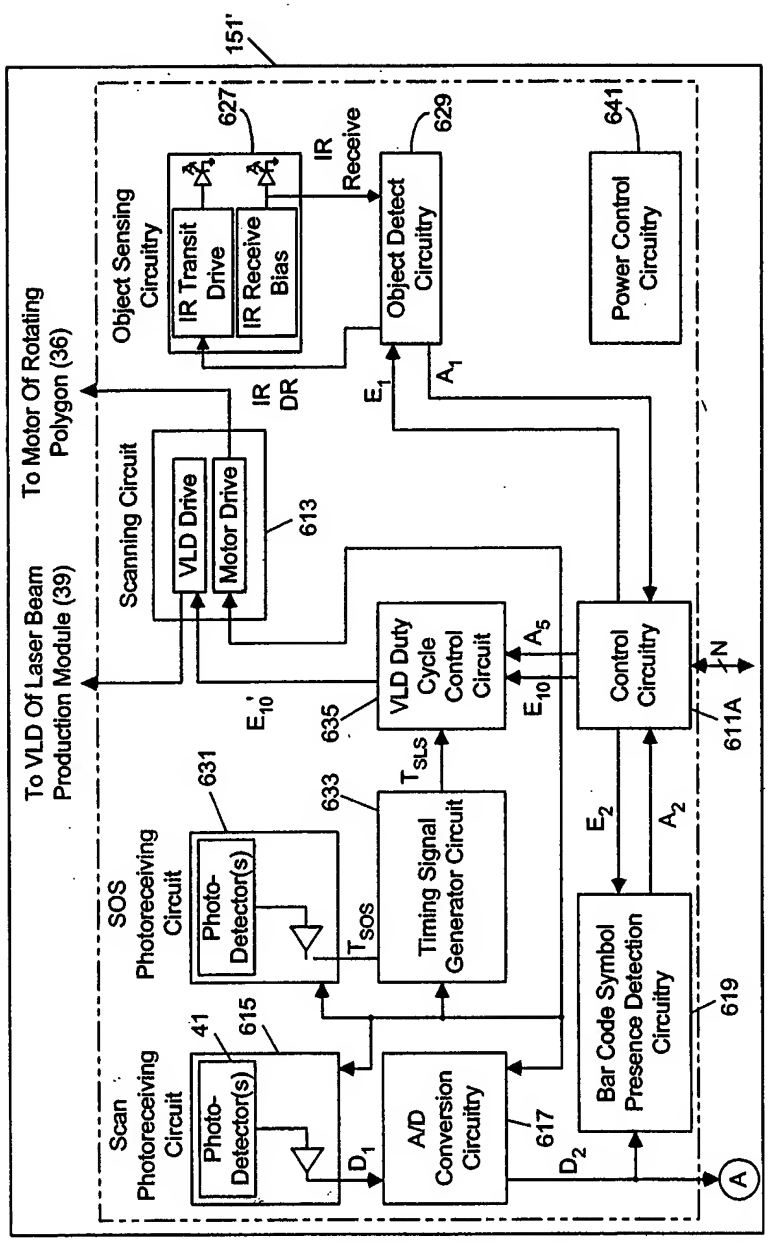

151'
To VLD Of Laser Beam Production Module (39)
To Motor Of Rotating Polygon (36)
Scan Photoreceiving Circuit
Photo-Detector(s)
41
615
D_1
A/D Conversion Circuitry
617
D_2
SOS Photoreceiving Circuit
Photo-Detector(s)
631
T_{SOS}
633
Timing Signal Generator Circuit
T_{SLS}
VLD Duty Cycle Control Circuit
635
E_{10}'
E_{10}
A_5
Scanning Circuit
VLD Drive
Motor Drive
613
IR DR
Object Sensing Circuitry
IR Transit Drive
IR Receive Bias
627
IR Receive
Object Detect Circuitry
629
E_1
A_1
Power Control Circuitry
641
Control Circuitry
611A
N
E_2
A_2
Bar Code Symbol Presence Detection Circuitry
619
A

FIG. 6A

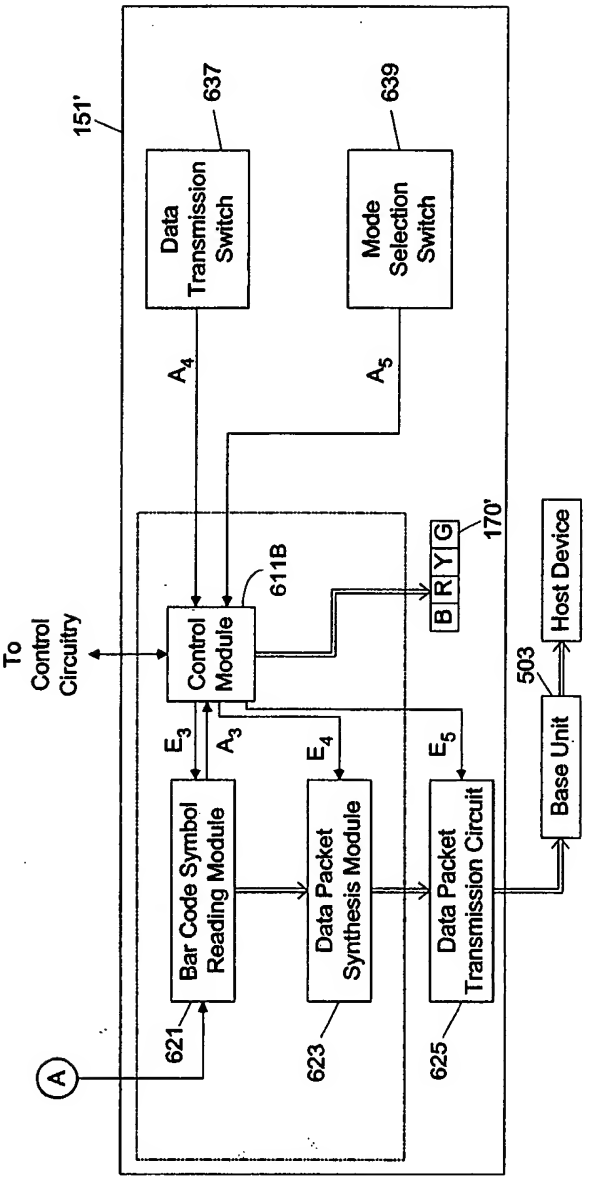

151'
637
639
Data Transmission Switch
Mode Selection Switch
A_4
A_5
170'
B R Y G
611B
To Control Circuitry
Control Module
Host Device
503
E_3
A_3
E_4
E_5
Bar Code Symbol Reading Module
Data Packet Synthesis Module
Data Packet Transmission Circuit
Base Unit
621
623
625
A

FIG. 6B

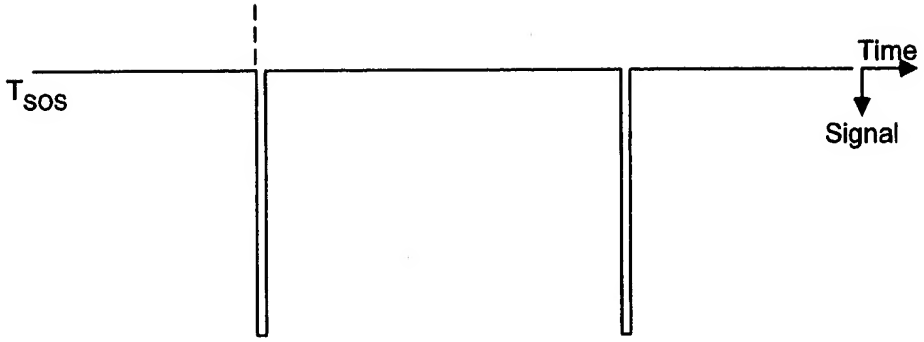


FIG. 7A

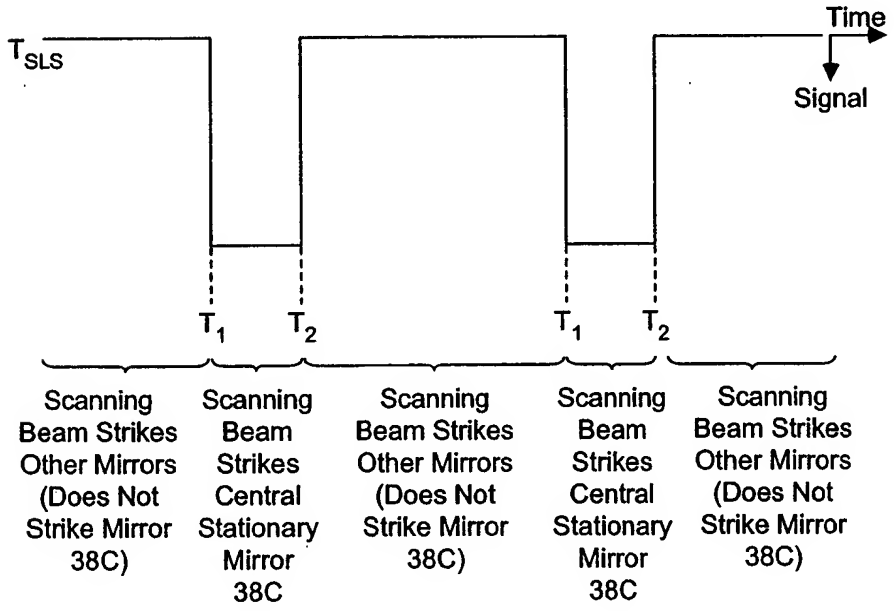


FIG. 7B

$$E_{10}' = (\overline{T_{SLS}} \times E_{10} \times A_5) + (E_{10} \times \overline{A_5})$$

FIG. 7C

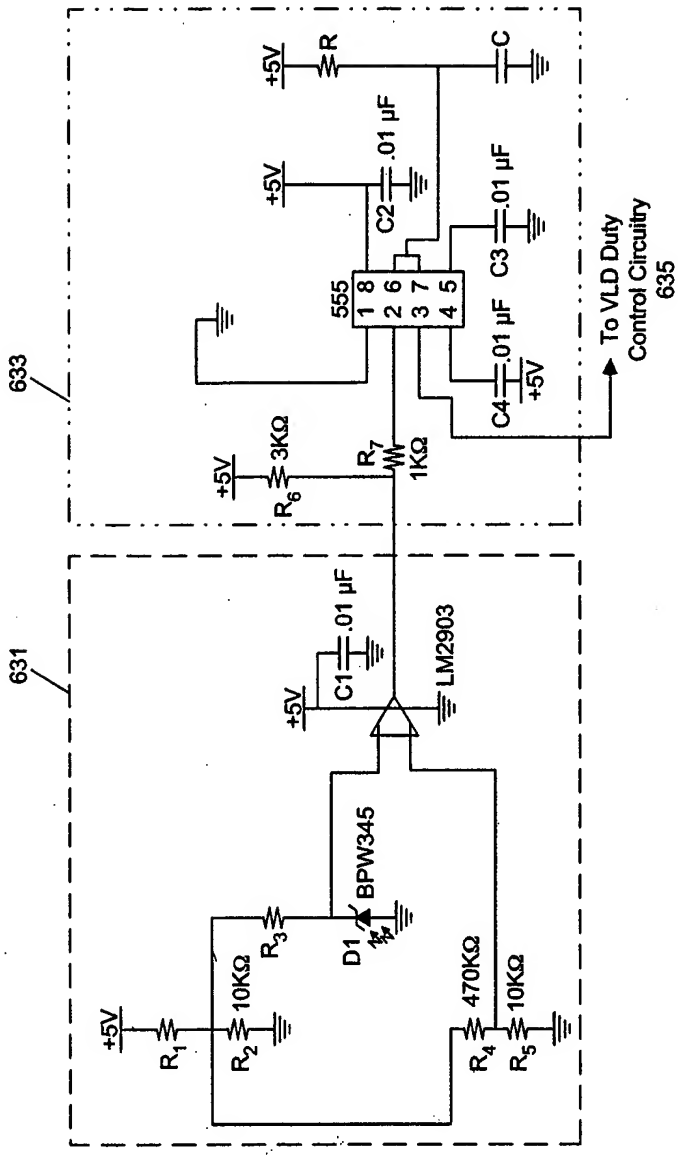

633
631
+5V
R
C
.01 µF
C2
C3
555
1 8
2 6
3 7
4 5
C4
To VLD Duty
Control Circuitry
635
3KΩ
R6
R7
1KΩ
C1
LM2903
BPW345
D1
R3
10KΩ
R2
R1
470KΩ
R4
10KΩ
R5

FIG. 7D

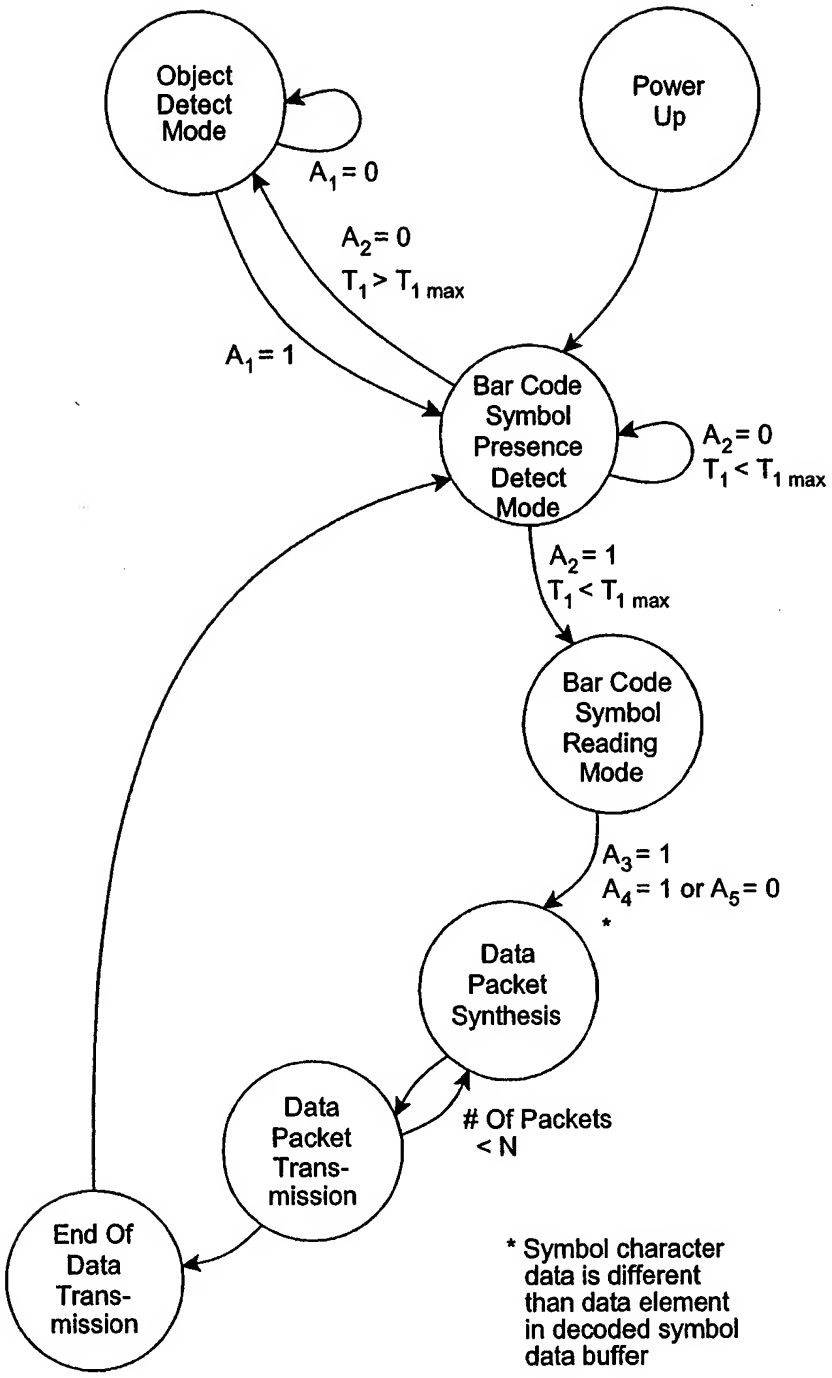

Object Detect Mode
Power Up
$A_1 = 0$
$A_2 = 0$
$T_1 > T_{1\,max}$
$A_1 = 1$
Bar Code Symbol Presence Detect Mode
$A_2 = 0$
$T_1 < T_{1\,max}$
$A_2 = 1$
$T_1 < T_{1\,max}$
Bar Code Symbol Reading Mode
$A_3 = 1$
$A_4 = 1$ or $A_5 = 0$
*
Data Packet Synthesis
Data Packet Trans-mission
Of Packets < N
End Of Data Trans-mission
* Symbol character data is different than data element in decoded symbol data buffer

FIG. 8

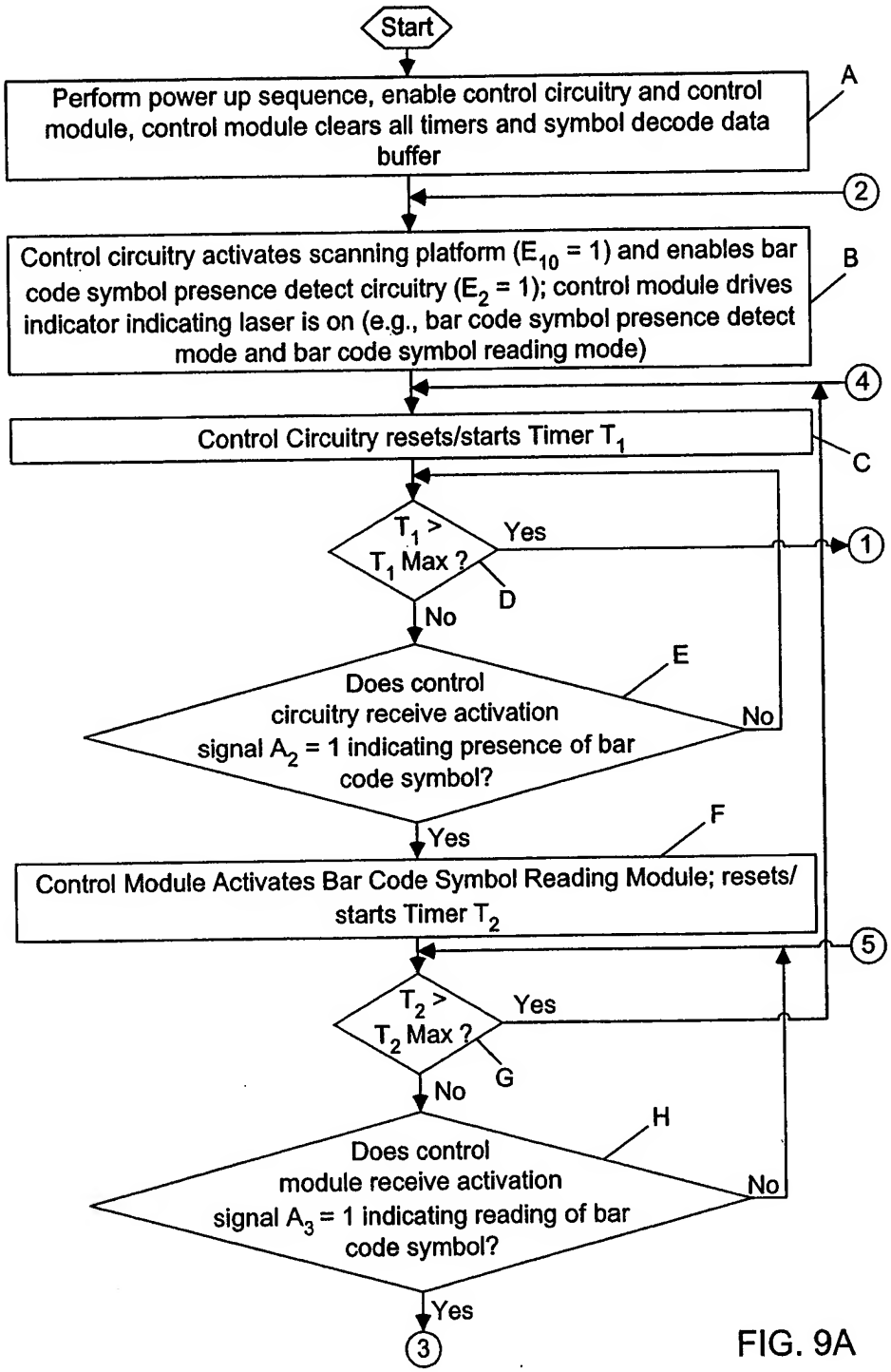

Start
Perform power up sequence, enable control circuitry and control module, control module clears all timers and symbol decode data buffer
A
2
Control circuitry activates scanning platform (E_{10} = 1) and enables bar code symbol presence detect circuitry (E_2 = 1); control module drives indicator indicating laser is on (e.g., bar code symbol presence detect mode and bar code symbol reading mode)
B
4
Control Circuitry resets/starts Timer T_1
C
T_1 > T_1 Max ?
Yes
1
D
No
Does control circuitry receive activation signal A_2 = 1 indicating presence of bar code symbol?
E
No
Yes
F
Control Module Activates Bar Code Symbol Reading Module; resets/ starts Timer T_2
5
T_2 > T_2 Max ?
Yes
G
No
Does control module receive activation signal A_3 = 1 indicating reading of bar code symbol?
H
No
Yes
3

FIG. 9A

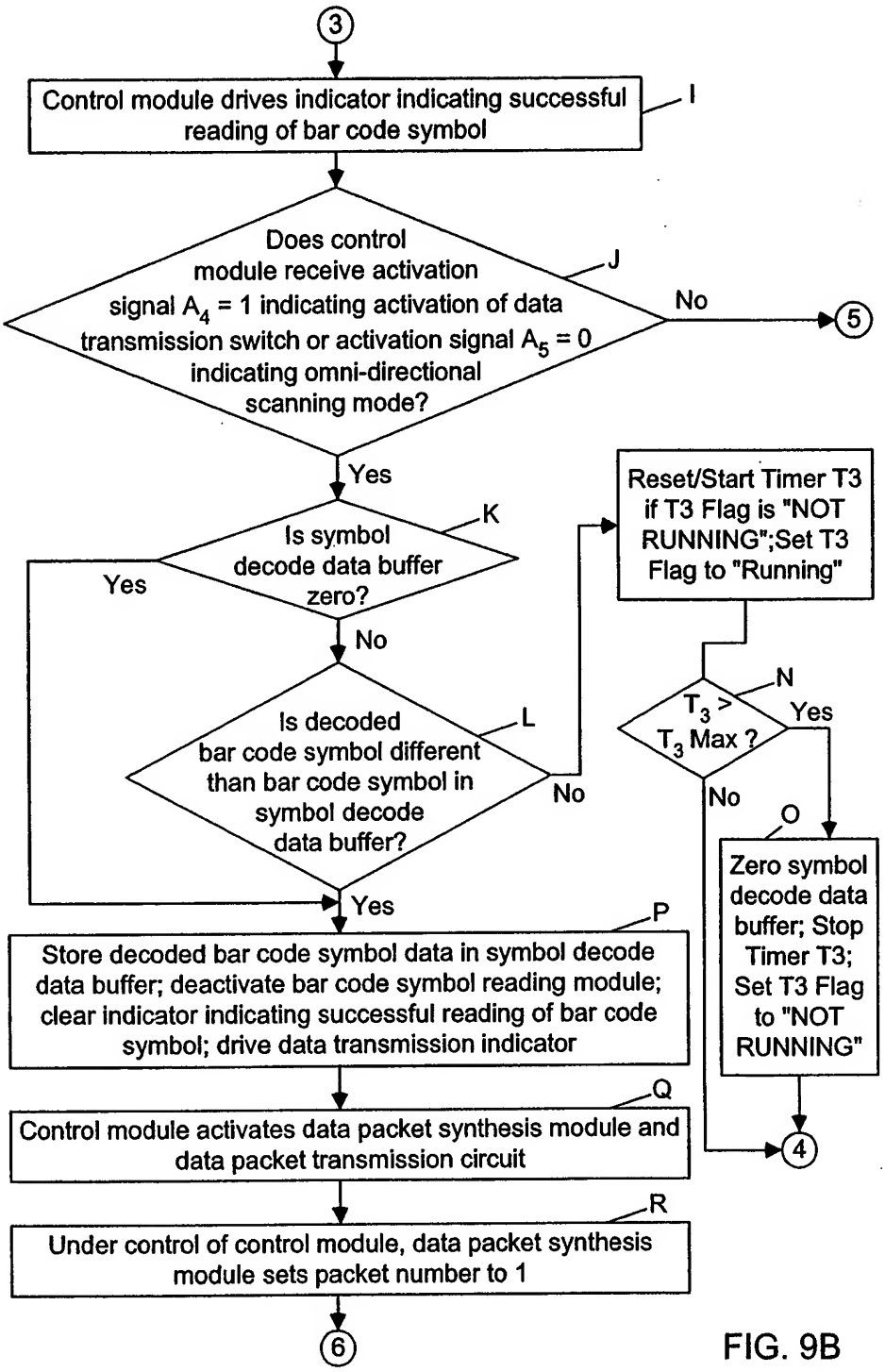

3
Control module drives indicator indicating successful reading of bar code symbol
I
Does control module receive activation signal A_4 = 1 indicating activation of data transmission switch or activation signal A_5 = 0 indicating omni-directional scanning mode?
J
No
5
Yes
Is symbol decode data buffer zero?
K
Yes
No
Is decoded bar code symbol different than bar code symbol in symbol decode data buffer?
L
No
Yes
Reset/Start Timer T3 if T3 Flag is "NOT RUNNING";Set T3 Flag to "Running"
$T_3 > T_3$ Max ?
N
Yes
No
Zero symbol decode data buffer; Stop Timer T3; Set T3 Flag to "NOT RUNNING"
O
4
Store decoded bar code symbol data in symbol decode data buffer; deactivate bar code symbol reading module; clear indicator indicating successful reading of bar code symbol; drive data transmission indicator
P
Control module activates data packet synthesis module and data packet transmission circuit
Q
Under control of control module, data packet synthesis module sets packet number to 1
R
6

FIG. 9B

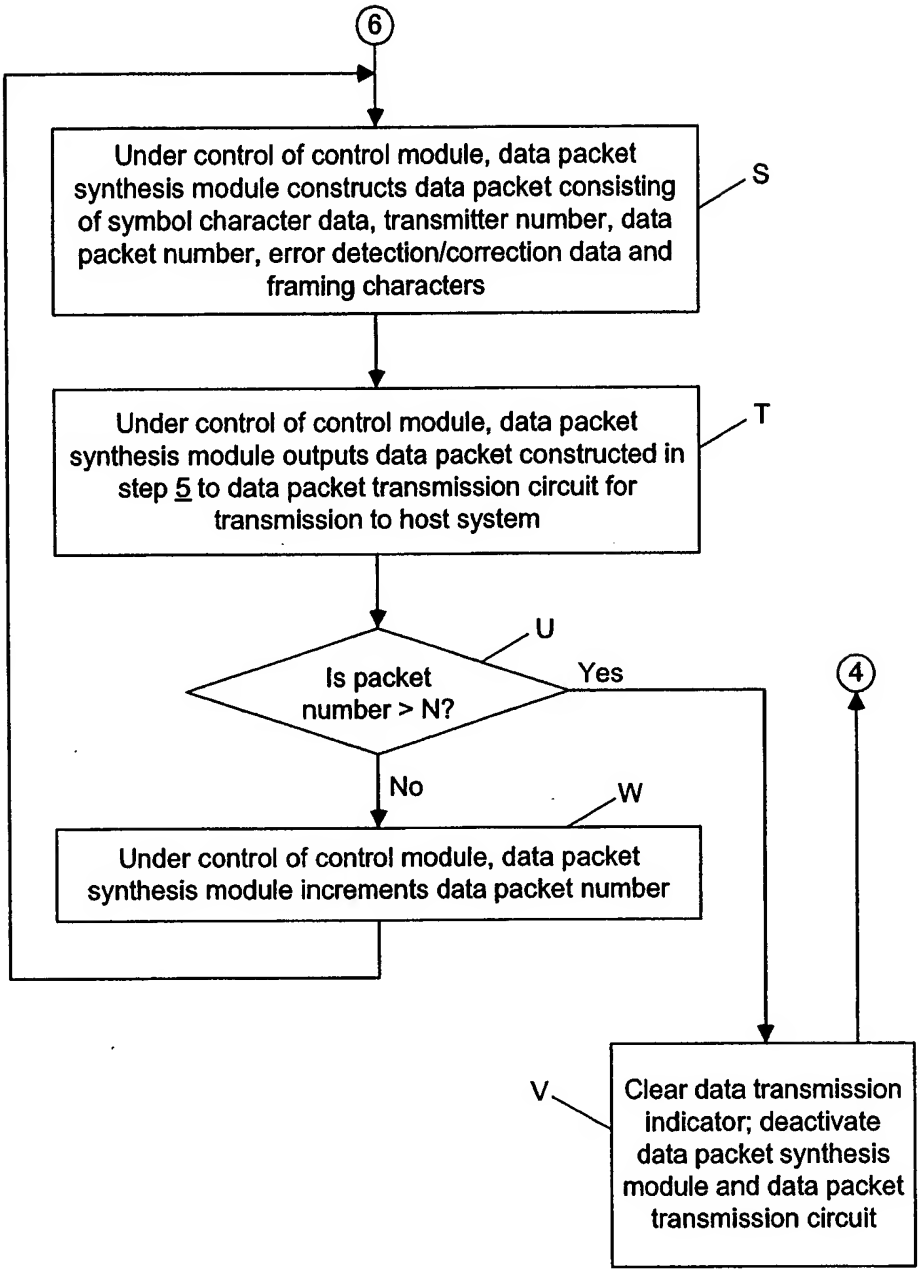

6
Under control of control module, data packet synthesis module constructs data packet consisting of symbol character data, transmitter number, data packet number, error detection/correction data and framing characters
S
Under control of control module, data packet synthesis module outputs data packet constructed in step 5 to data packet transmission circuit for transmission to host system
T
U
Is packet number > N?
Yes
No
W
Under control of control module, data packet synthesis module increments data packet number
4
V
Clear data transmission indicator; deactivate data packet synthesis module and data packet transmission circuit

FIG. 9C

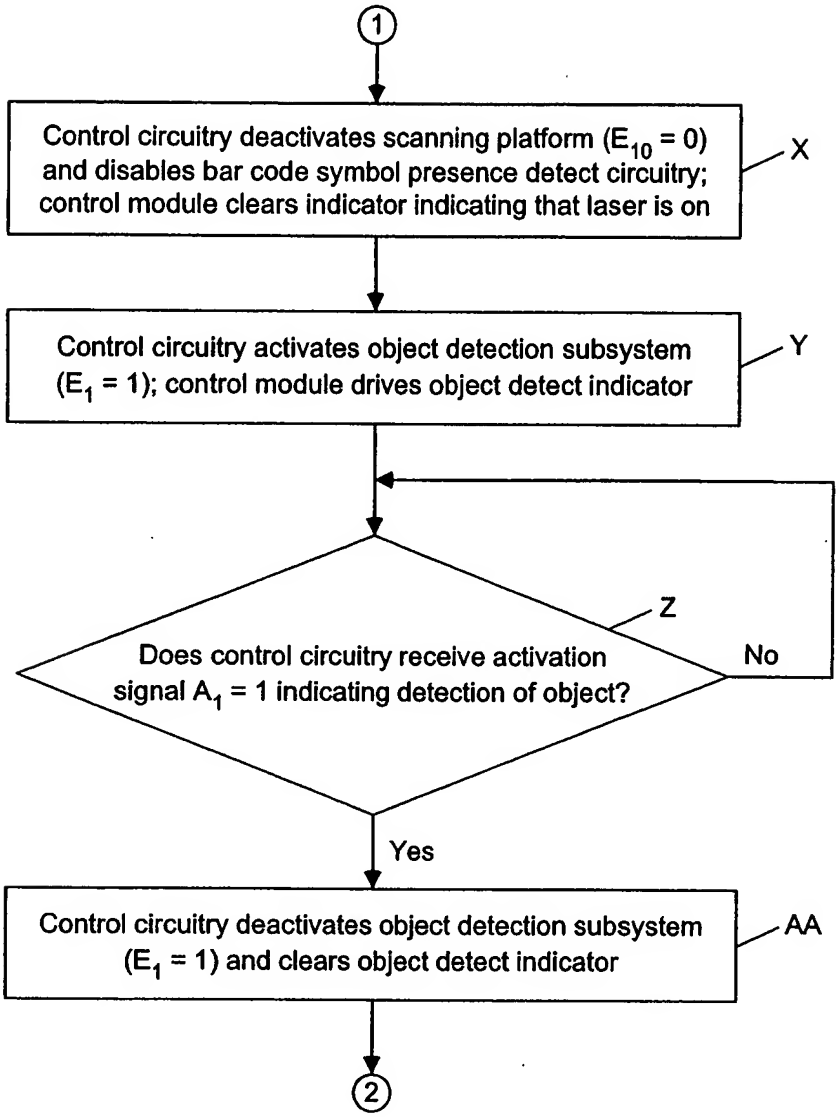
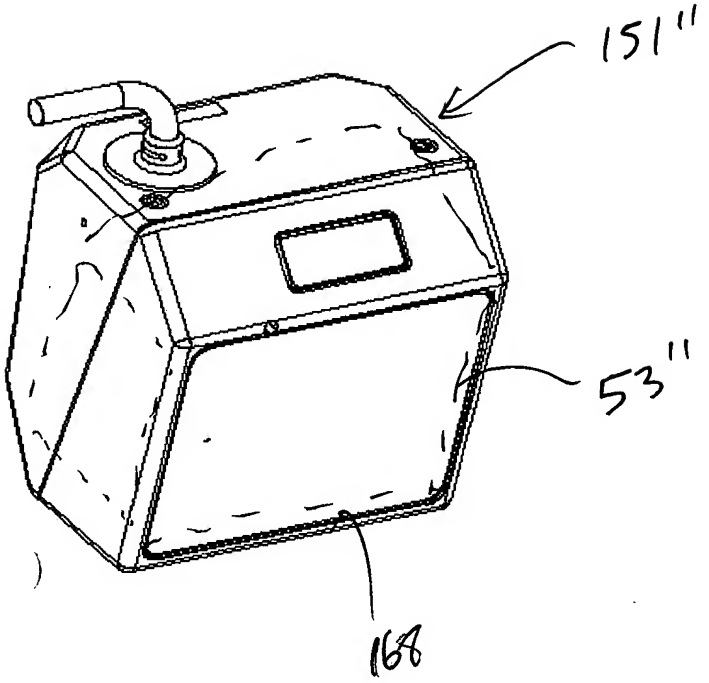

1
Control circuitry deactivates scanning platform (E_{10} = 0) and disables bar code symbol presence detect circuitry; control module clears indicator indicating that laser is on
X
Control circuitry activates object detection subsystem (E_1 = 1); control module drives object detect indicator
Y
Z
Does control circuitry receive activation signal A_1 = 1 indicating detection of object?
No
Yes
Control circuitry deactivates object detection subsystem (E_1 = 1) and clears object detect indicator
AA
2

FIG. 9D

OMNI-DIRECTIONAL BAR CODE READING MODE



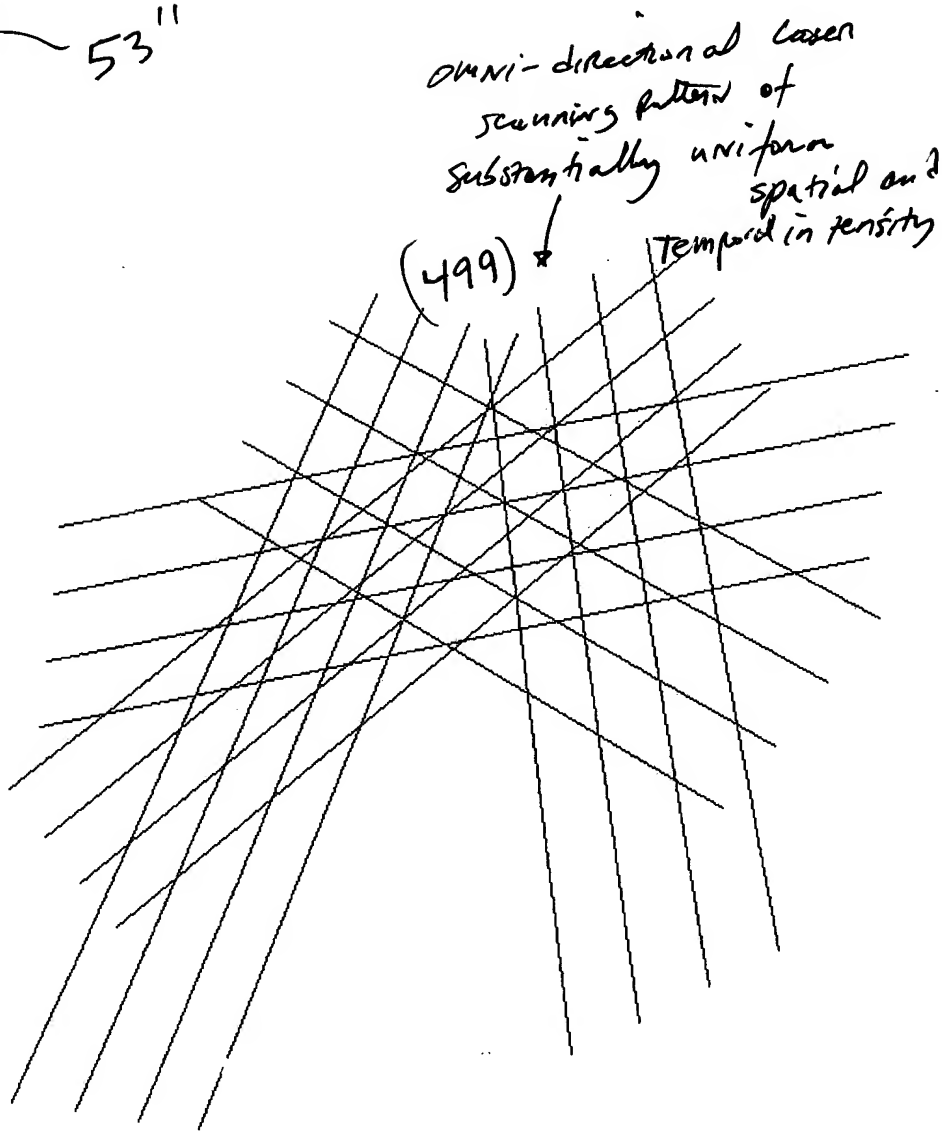
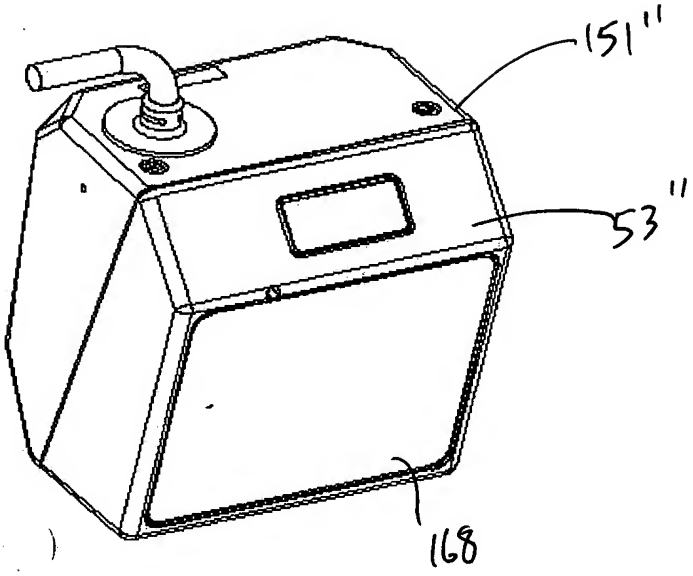


FIG. 10A

UNI-DIRECTIONAL BAR CODE READING MODE



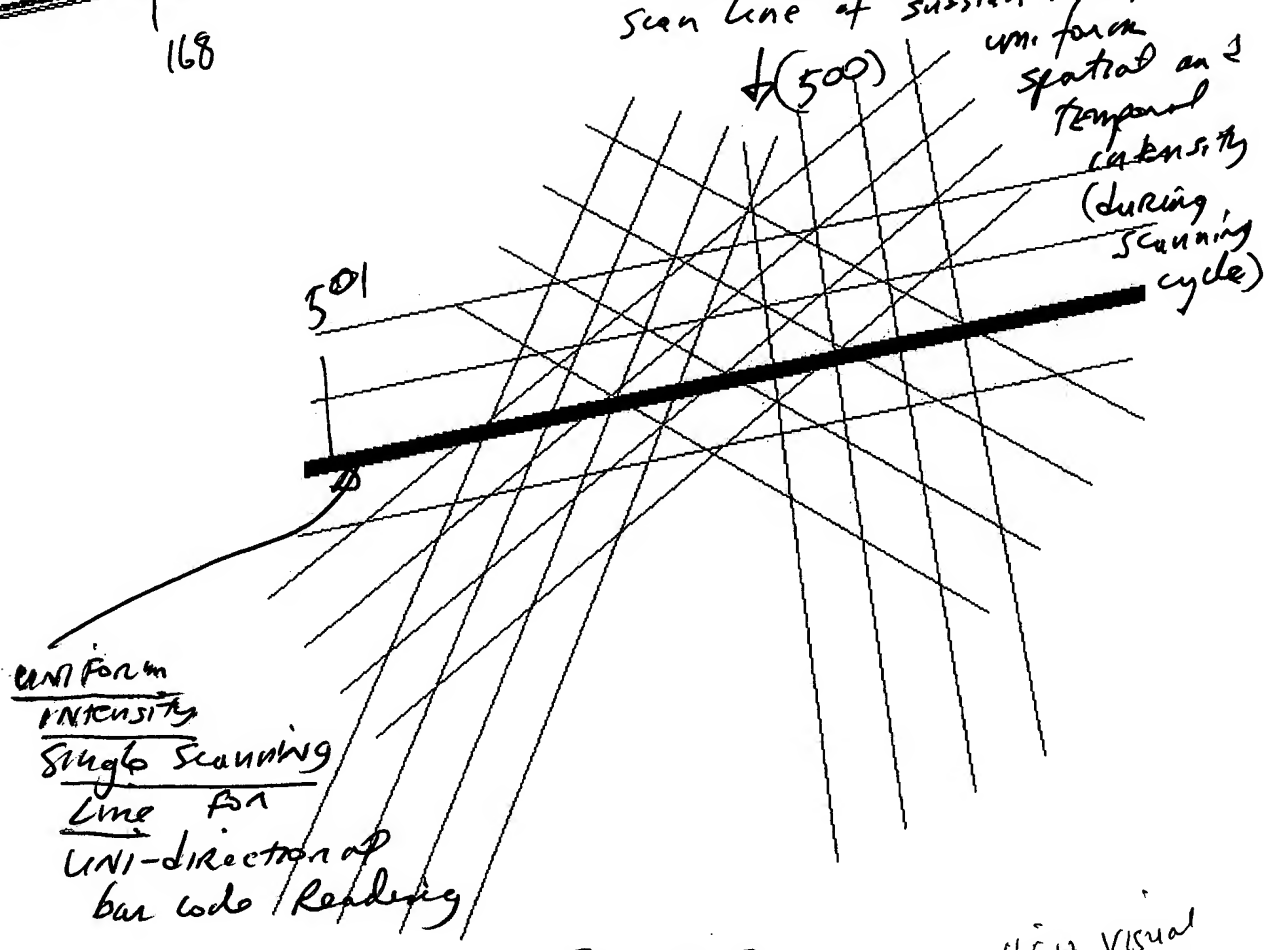


FIG. 10B

HIGH VISUAL CONTRAST

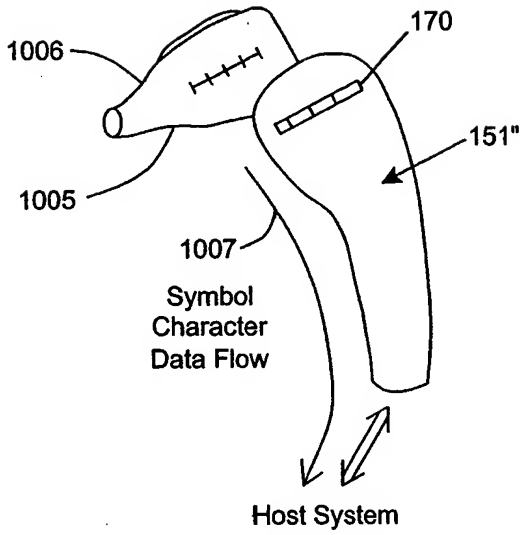

1006
170
151"
1005
1007
Symbol
Character
Data Flow
Host System

FIG. 11A

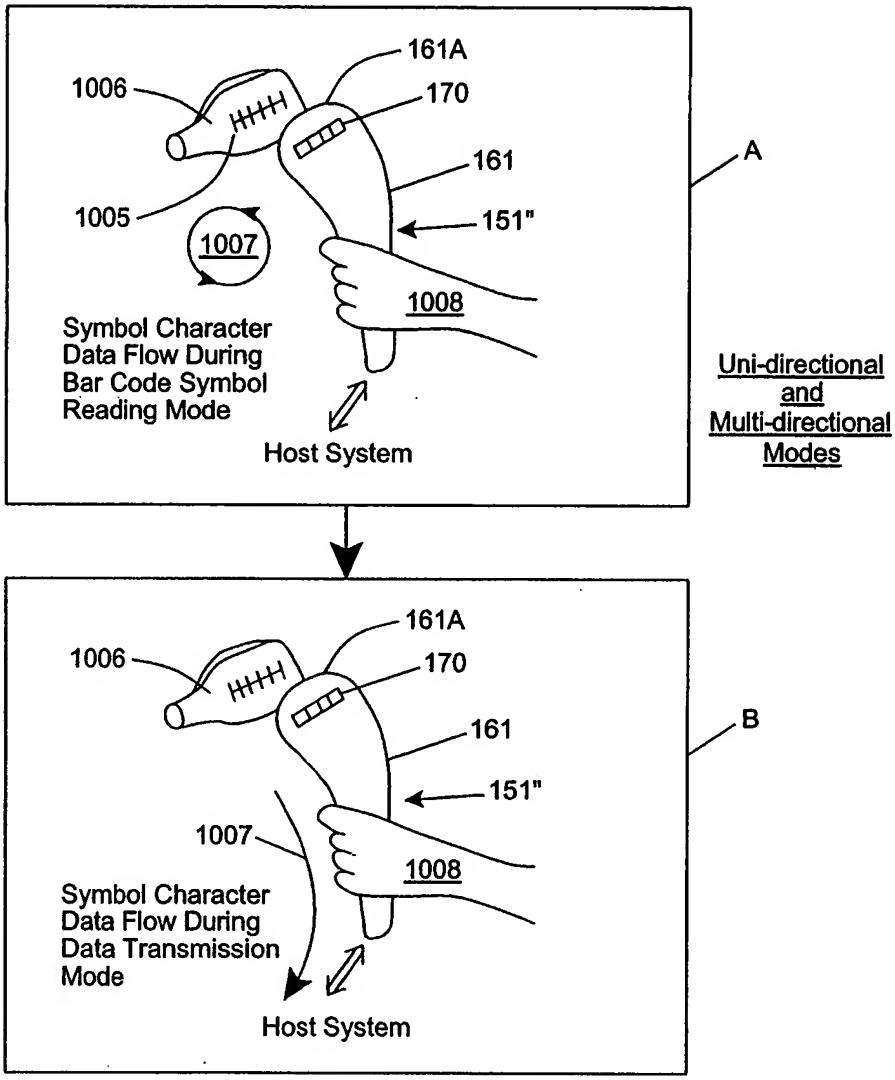

161A
1006
170
161
A
1005
1007
151"
1008
Symbol Character
Data Flow During
Bar Code Symbol
Reading Mode
Host System
Uni-directional
and
Multi-directional
Modes
161A
1006
170
161
B
151"
1007
1008
Symbol Character
Data Flow During
Data Transmission
Mode
Host System

FIG. 11B

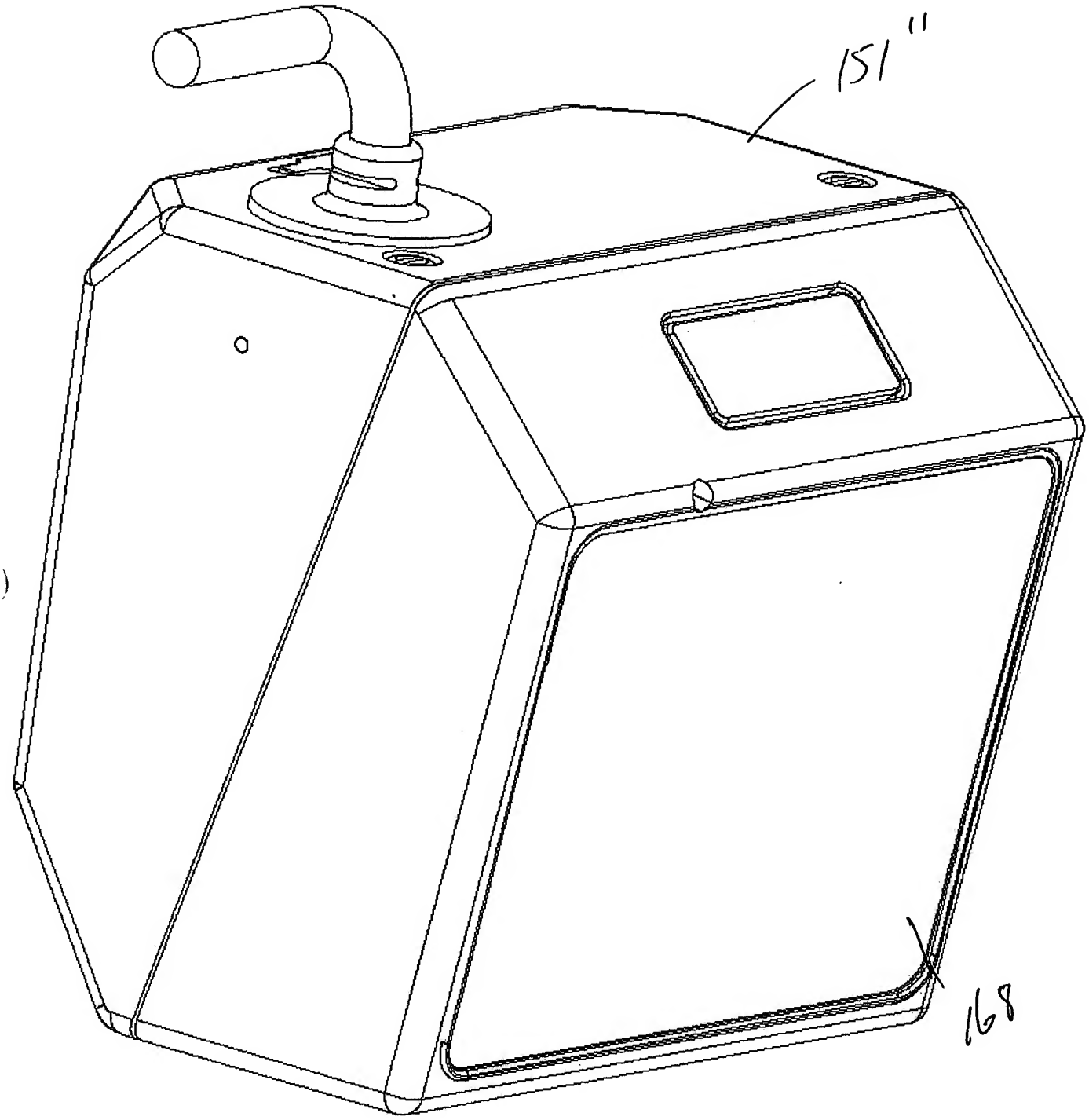


FIG. 12A

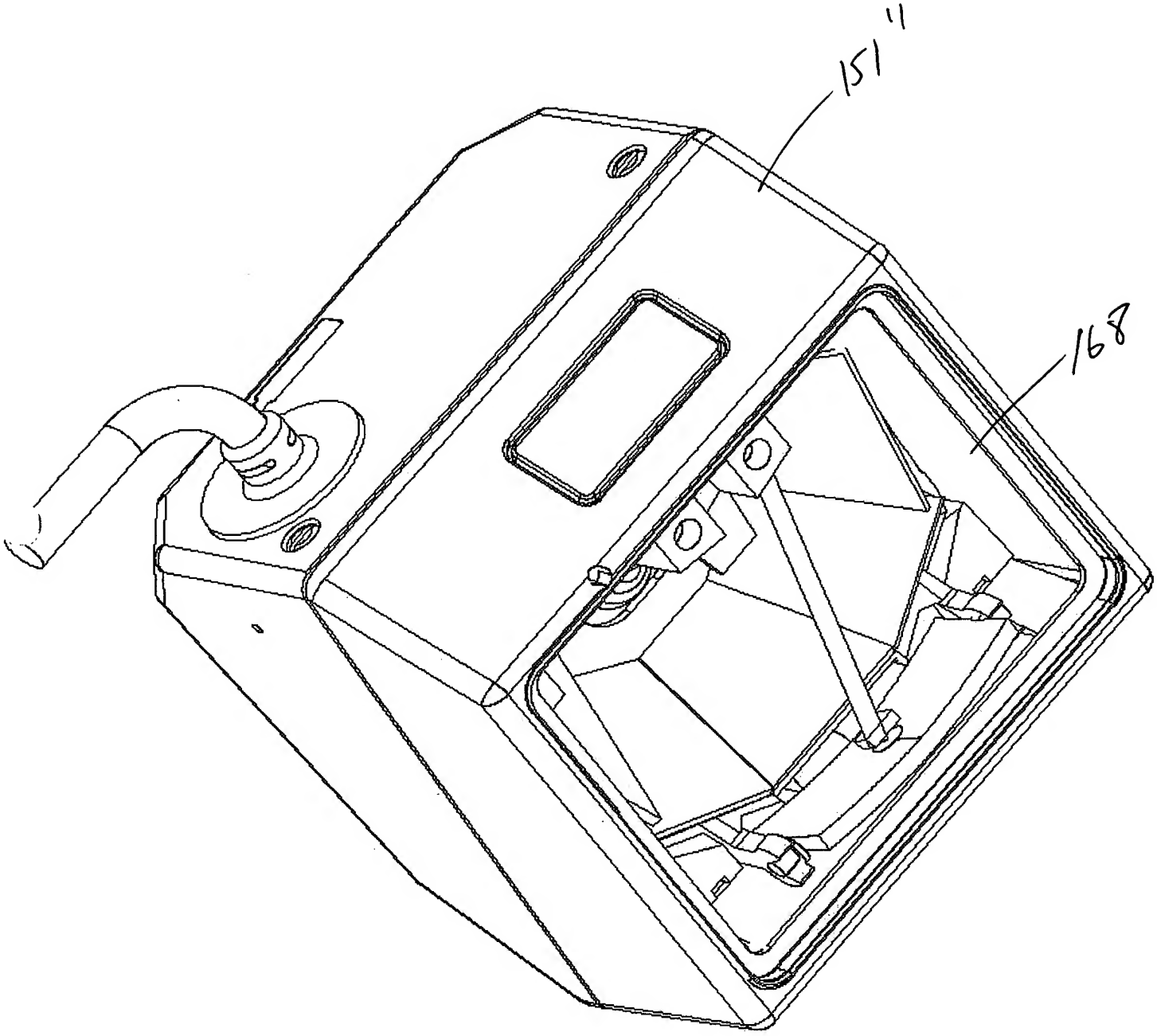


FIG. 12B

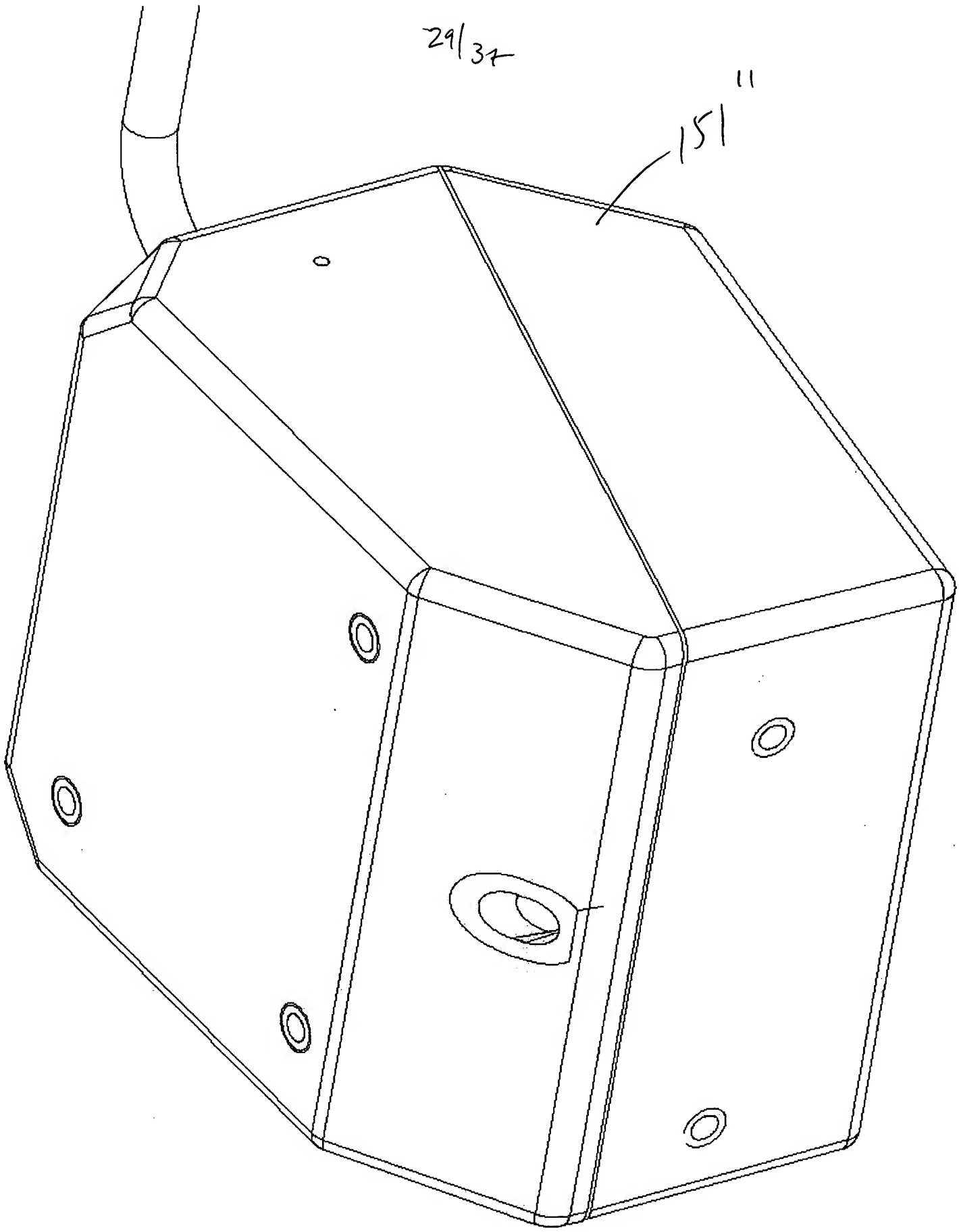


FIG. 1DC

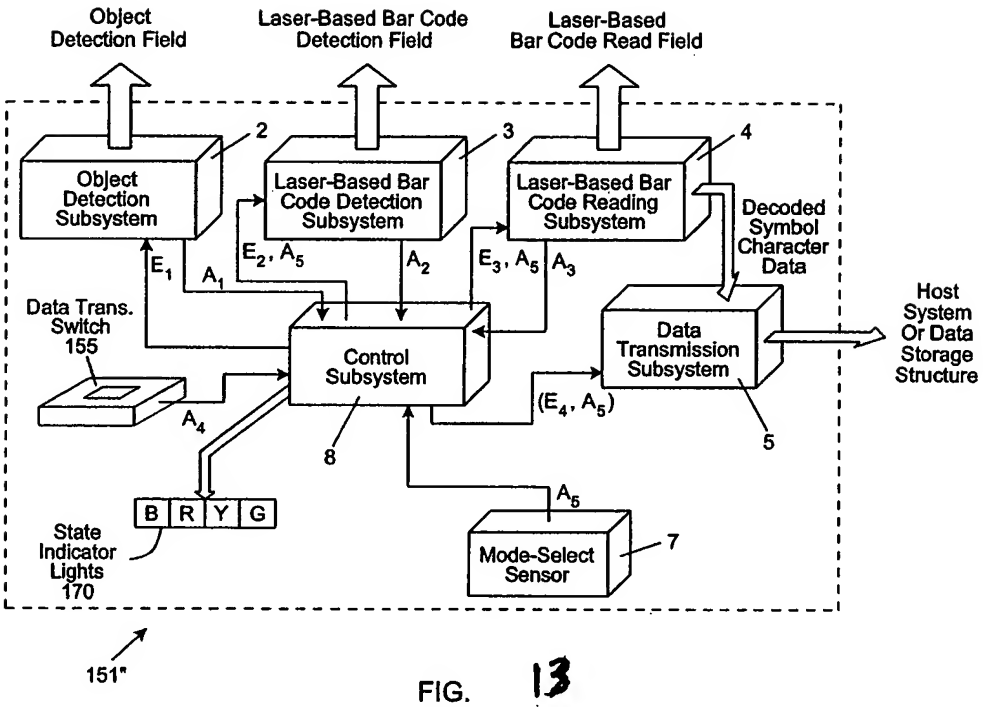

Object Detection Field
Laser-Based Bar Code Detection Field
Laser-Based Bar Code Read Field
Object Detection Subsystem
2
Laser-Based Bar Code Detection Subsystem
3
Laser-Based Bar Code Reading Subsystem
4
Decoded Symbol Character Data
E_1
A_1
E_2, A_5
A_2
E_3, A_5
A_3
Data Trans. Switch 155
Control Subsystem
Data Transmission Subsystem
Host System Or Data Storage Structure
A_4
(E_4, A_5)
8
5
A_5
B R Y G
State Indicator Lights 170
Mode-Select Sensor
7
151"

FIG. 13

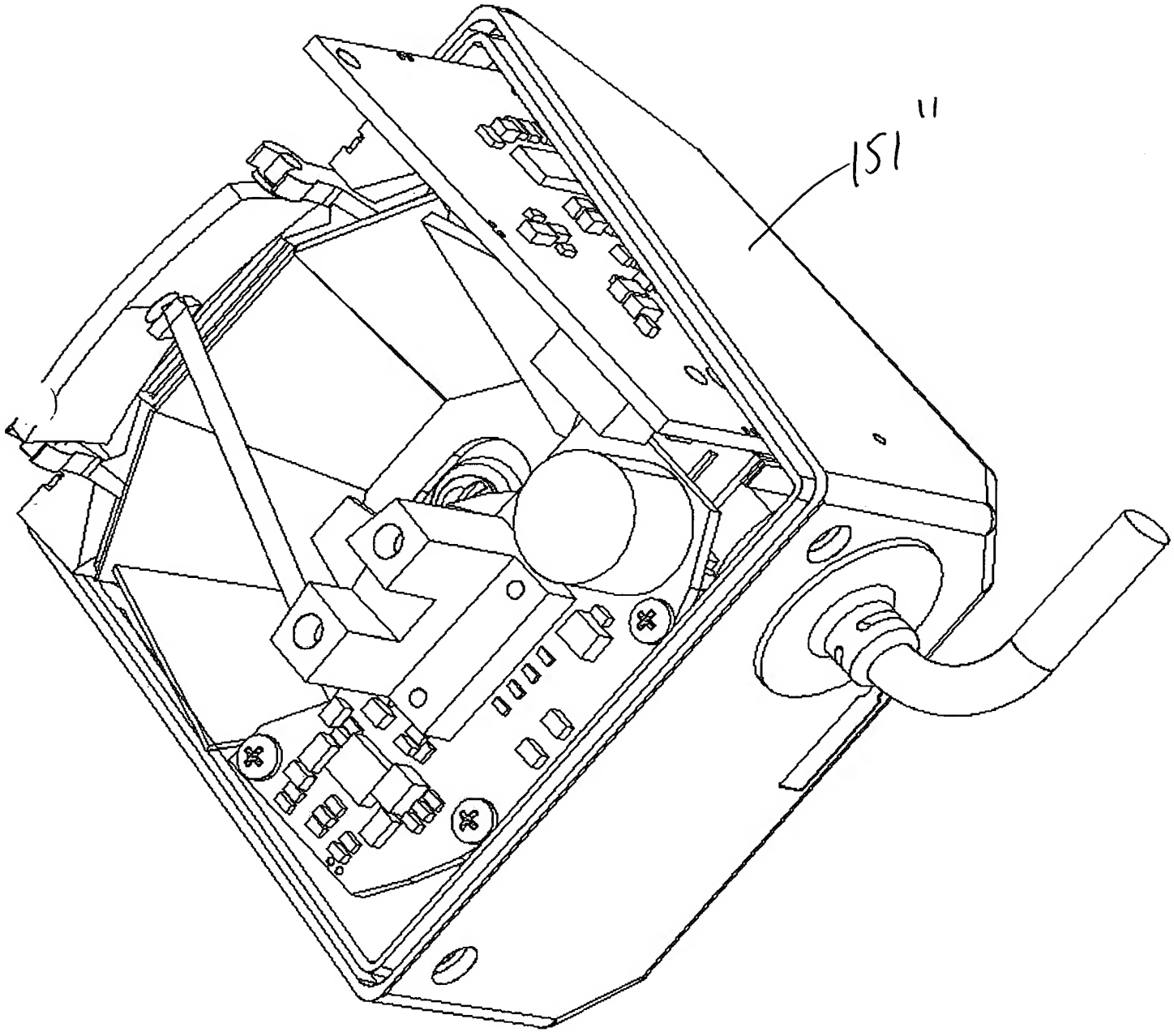


FIG.14A

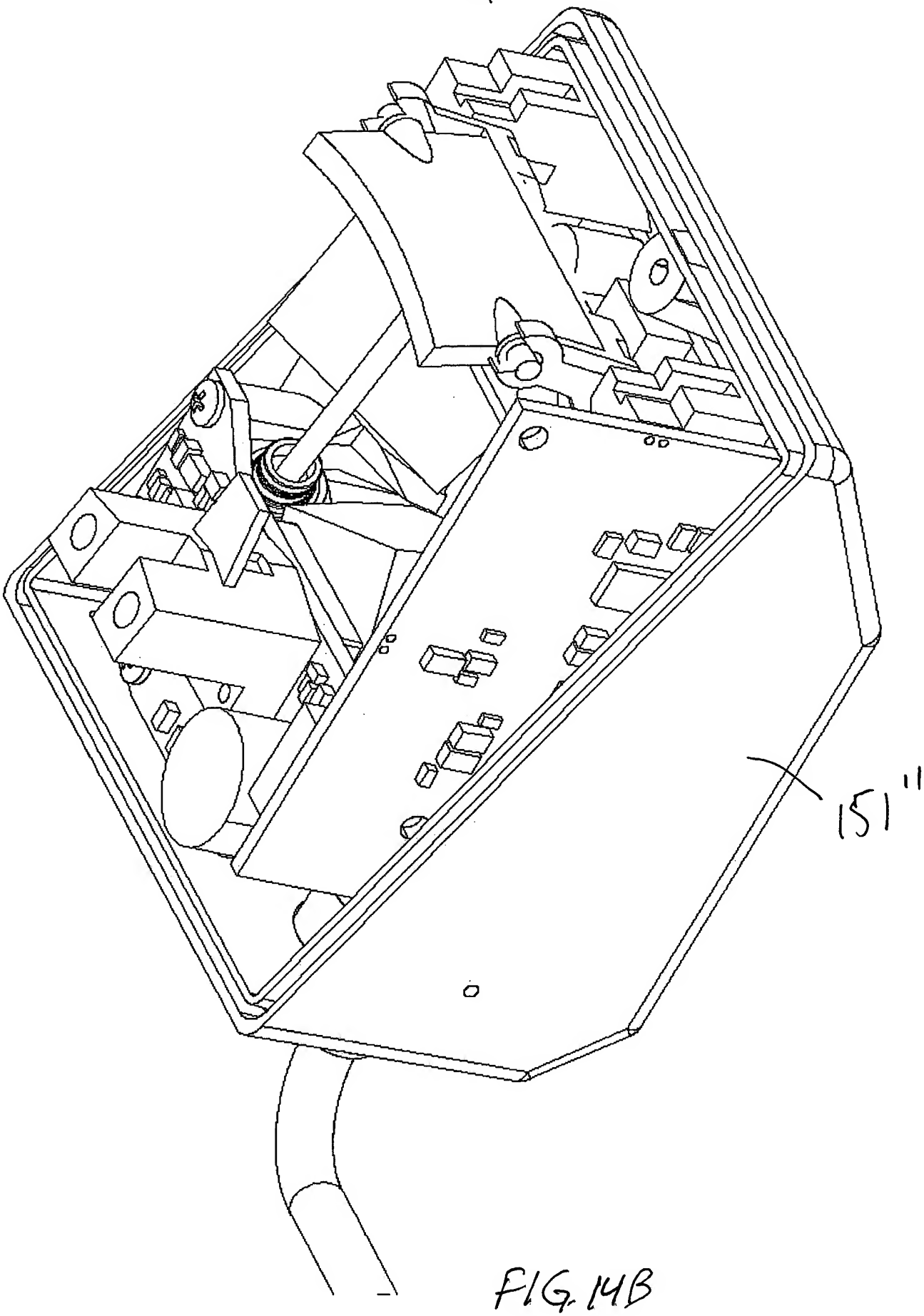


FIG. 14B

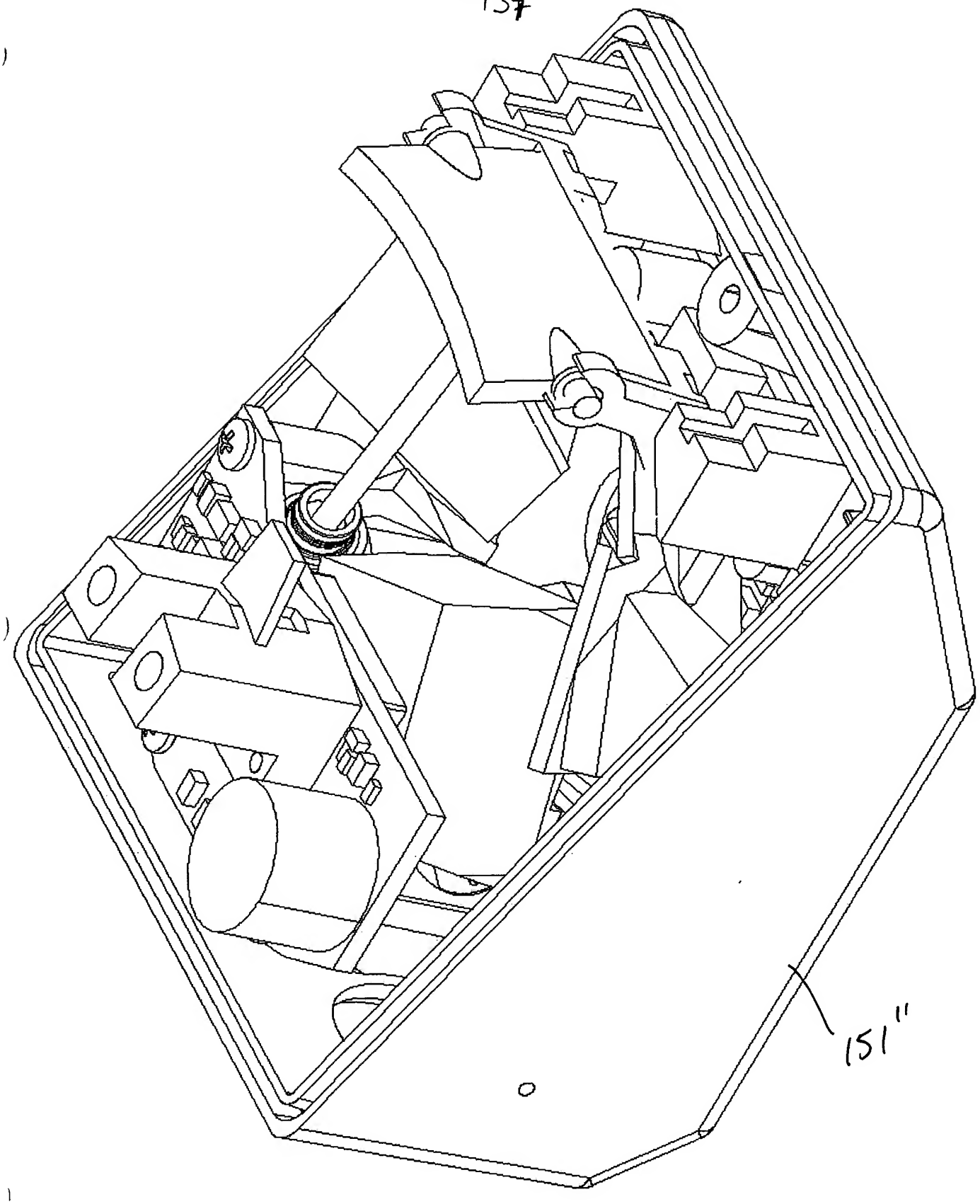


FIG. 14C

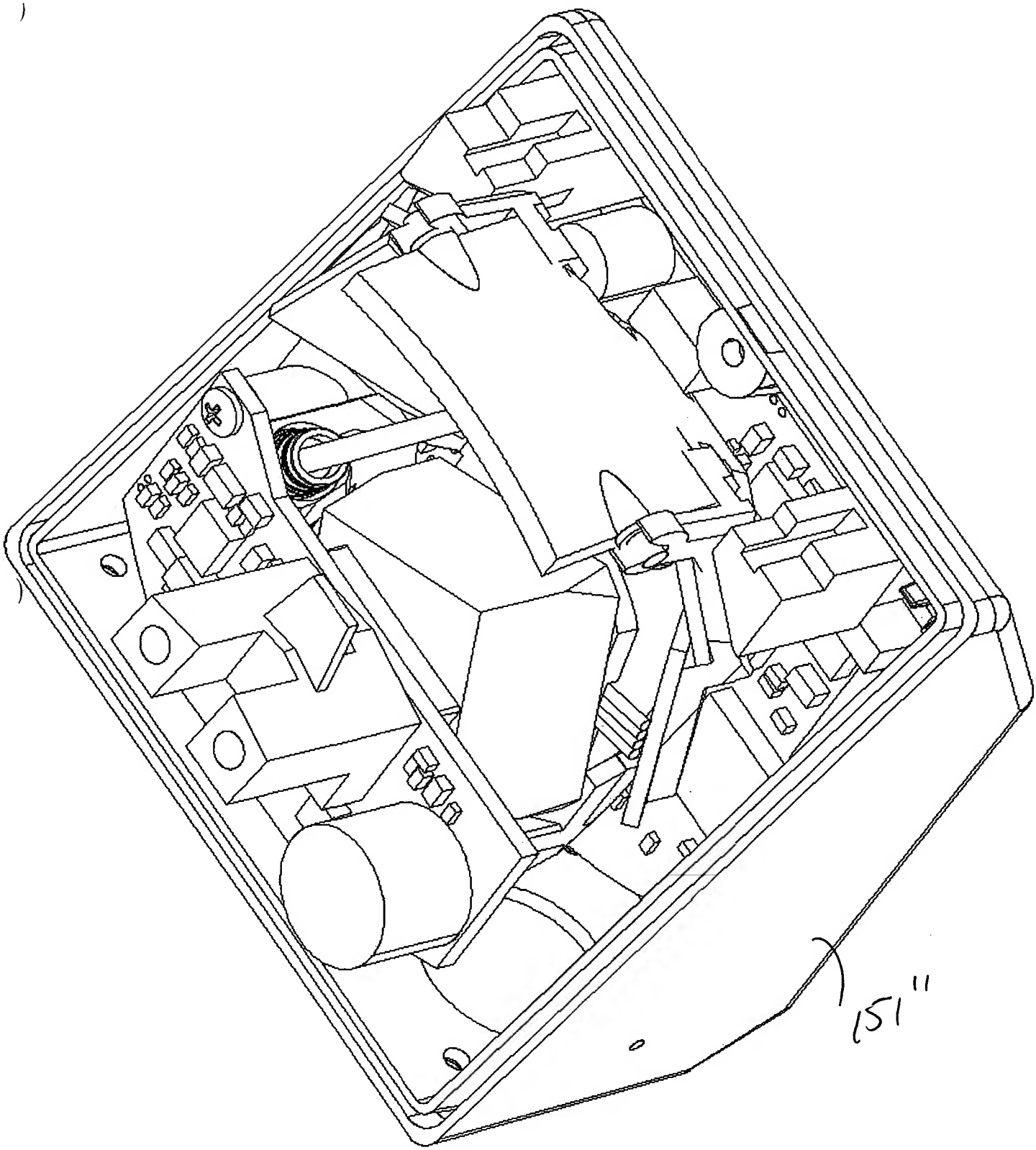


FIG. 14D

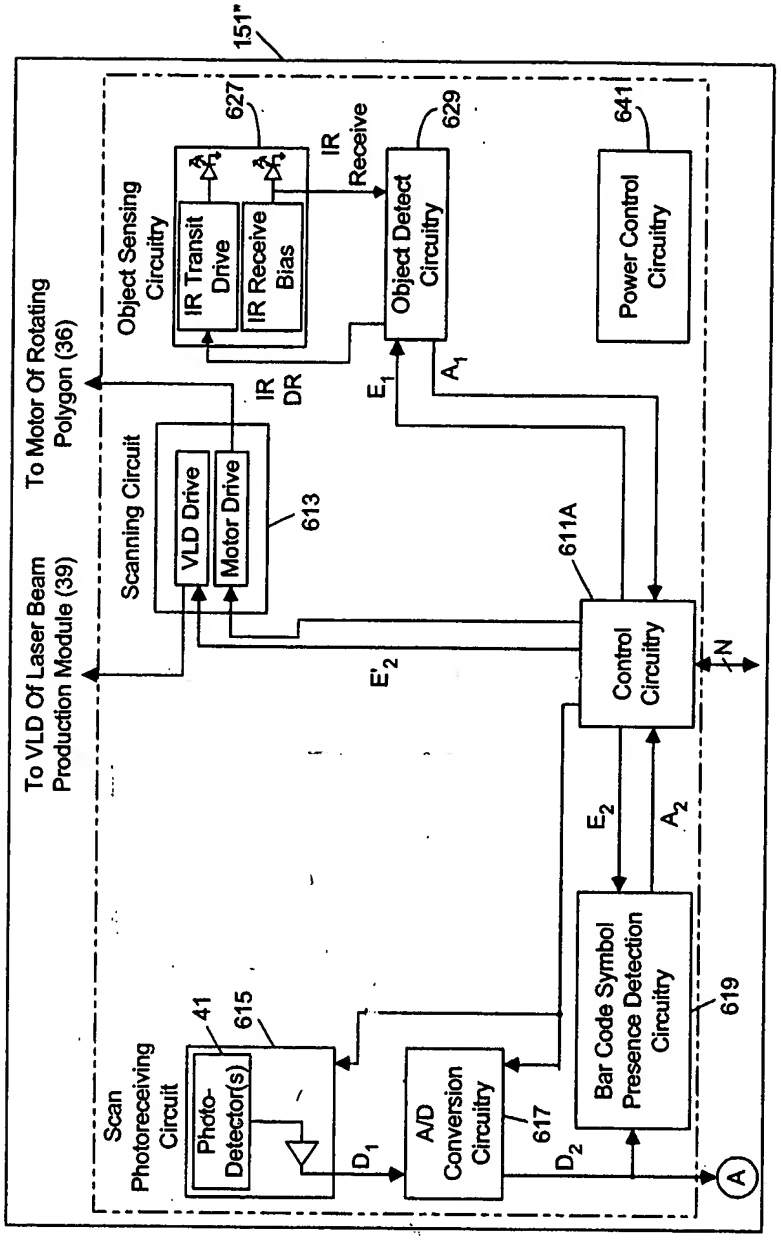

151'
To VLD Of Laser Beam Production Module (39)
To Motor Of Rotating Polygon (36)
Scan Photoreceiving Circuit
Photo-Detector(s)
41
615
Scanning Circuit
VLD Drive
Motor Drive
613
Object Sensing Circuitry
IR Transit Drive
IR Receive Bias
627
IR Receive
Object Detect Circuitry
629
Power Control Circuitry
641
IR DR
E_1
A_1
E'_2
611A
Control Circuitry
N
E_2
A_2
A/D Conversion Circuitry
617
D_1
D_2
Bar Code Symbol Presence Detection Circuitry
619
A

FIG 15A

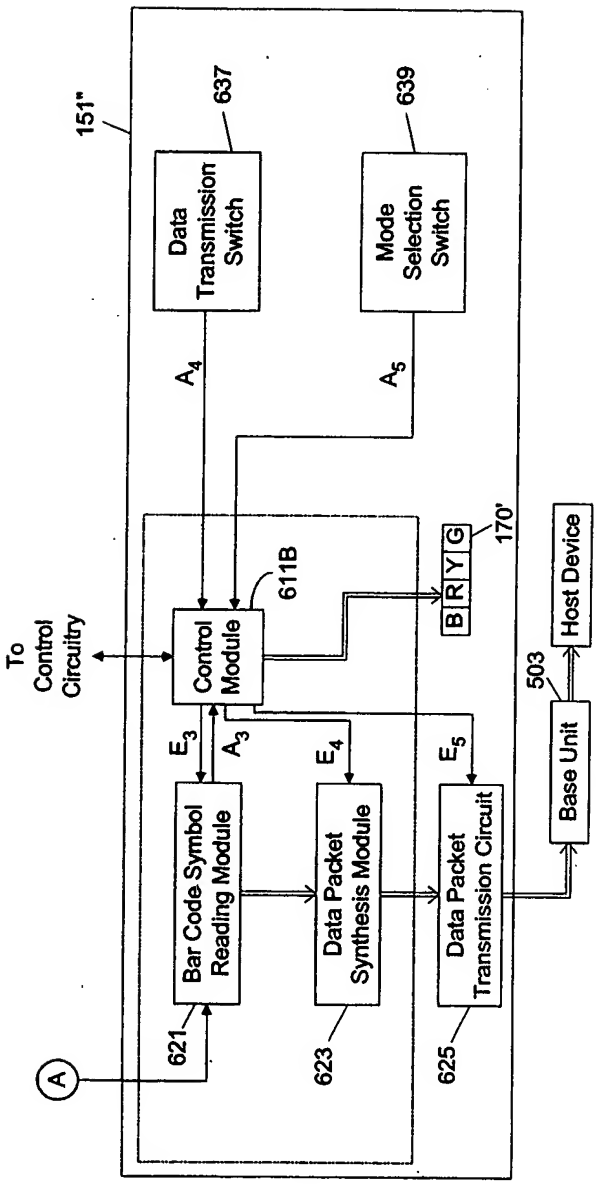

151"
637
639
Data Transmission Switch
Mode Selection Switch
A_4
A_5
611B
Control Module
To Control Circuitry
B R Y G
170'
Host Device
503
Base Unit
E_3
A_3
E_4
E_5
Bar Code Symbol Reading Module
Data Packet Synthesis Module
Data Packet Transmission Circuit
621
623
625
A

FIG. 15B

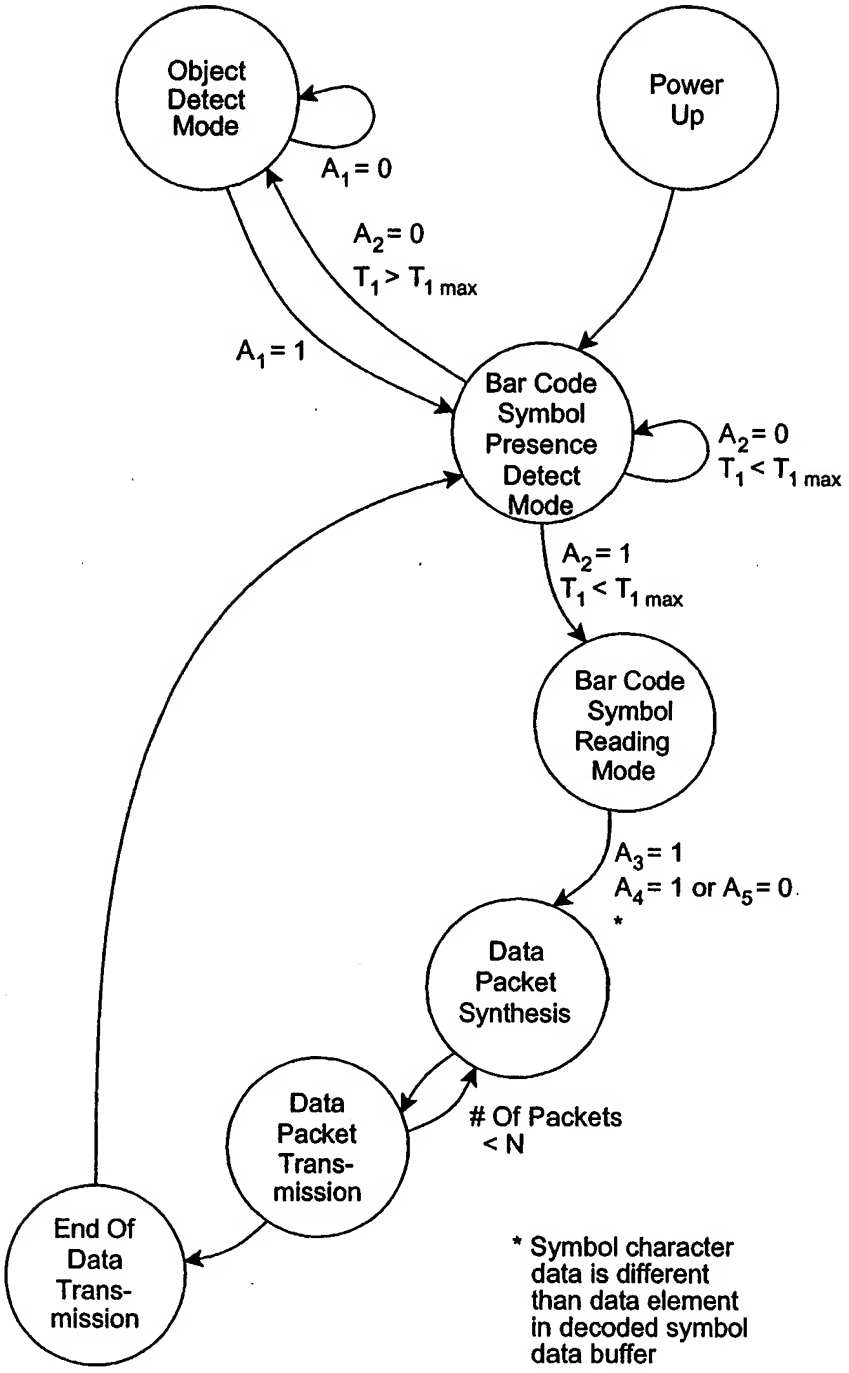

Object Detect Mode
Power Up
$A_1 = 0$
$A_2 = 0$
$T_1 > T_{1\,max}$
$A_1 = 1$
Bar Code Symbol Presence Detect Mode
$A_2 = 0$
$T_1 < T_{1\,max}$
$A_2 = 1$
$T_1 < T_{1\,max}$
Bar Code Symbol Reading Mode
$A_3 = 1$
$A_4 = 1$ or $A_5 = 0$
*
Data Packet Synthesis
Data Packet Trans-mission
Of Packets < N
End Of Data Trans-mission
* Symbol character data is different than data element in decoded symbol data buffer

FIG.16